20

NARRATIVE END ITEM REPORT ON SATURN S-IVB-501 (DAC S/N 1005)

AUGUST 1966
DOUGLAS REPORT SM-53184

NARRATIVE END ITEM REPORT ON SATURN S-IVB - 501 (DAC S/N 1005)

AUGUST 1966
DOUGLAS REPORT SM-53184

J. W. Morris

PREPARED BY: J. W. MORRIS, ACTING
BRANCH CHIEF, QUALITY DATA AND REPORTING
RELIABILITY ASSURANCE DEPARTMENT

PREPARED FOR:
NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
UNDER NASA CONTRACT NAS7-101

K A Frederiksen

APPROVED BY: K. A. FREDERIKSEN
MANAGER, QUALITY ENGINEERING
RELIABILITY ASSURANCE DEPARTMENT

W. W. Reaser

APPROVED BY: W. W. REASER
DIRECTOR, SATURN PROGRAM
PRODUCT ASSURANCE

DOUGLAS MISSILE & SPACE SYSTEMS DIVISION
SPACE SYSTEMS CENTER - HUNTINGTON BEACH, CALIFORNIA

ABSTRACT

The Narrative End Item Report contained herein is a narrative summary of the Douglas manufacturing and test records relative to the Saturn S-IVB-AS501 Flight Stage (Douglas P/N 1A39300-1, S/N 1005).

Narrations are included on those conditions related to permanent nonconformances which were generated during the manufacturing cycle and existed at the time of acceptance testing. The report sets forth data pertinent to total time or cycle accumulation on time or cycle significant items. Data relative to variations in flight critical components is included. There is no provision to update or revise the NEIR after initial release.

Descriptors

NEIR
Documentation
Configuration
Significant Items
Stage Checkout
Manufacture and Test

PREFACE

This Narrative End Item Report is prepared by the Reliability Assurance Operations Department of Douglas Aircraft Company, Inc. for the National Aeronautics and Space Administration under contract NAS7-101. This report is presented in response to requirements of NPC 200-2, paragraph 14.2.4, and issued in accordance with Douglas Report SM-41410, Data Submittal Document, Saturn S-IVB System, which details contract data required from the Douglas Aircraft Company, Inc. The report summarizes the period from initial stage acceptance testing at the Douglas Space Systems Center, Huntington Beach, California, through final acceptance testing at the Douglas Sacramento Test Center (STC), Sacramento, California, and turnover to NASA/MSFC for delivery to NASA/FTC.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

APPENDIX 1

APPENDIX 2

APPENDIX 3

APPENDIX 4

SECTION 1

INTRODUCTION

1. INTRODUCTION

1.1 Scope

The NEIR compiles quality evidence and assessments of a particular end item for use in evaluating program objectives and end item usage. This report narrates upon the Saturn S-IVB-501 and discusses the following:

a. Final configuration

b. Replacements made during test and final checkout (including serial number and change letter of articles removed or substituted)

c. Nature of problems and malfunctions encountered

d. Corrective action taken or pending

e. Extent of retests or tests not completed

f. Total operating hours or cycles for each time or cycle significant system or subsystem

1.2 Format

This document is organized into sections, with each section fulfilling a specific purpose. The title of each section, and a brief outline of its purpose follow. Section:

1. INTRODUCTION. This section discusses the scope of the NEIR, the Stage Design Concept, Documentation, and Turnover Data.
2. SYSTEM TEST SUMMARIES. A brief summary of principal test areas is presented to give management personnel a concise view of successful test achievement, and remaining areas of concern.
3. STAGE CONFIGURATION. Conformance to engineering design, accepted deviations and waivers, and data on time/cycle significant items.
4. DETAILED NARRATIVES. A presentation in depth of checkout operations, presentated with the checkouts at Sacramento Test Center (STC) first, followed by Space Systems Center (SSC) checkouts. Failure and Rejection Reports (FARRs) referenced, as applicable for each paragraph.

APPENDICES:

1. ILLUSTRATIONS. Graphic Art, giving sufficient system detail to clarify areas discussed in the text.
2. CHARTS. Weld defect charts which show weld discrepancies, referenced to Table II Failure and Rejection Reports.

1.2 (Continued)

3. TABLES.

   a. TABLE I. A compilation of FARR's recorded during systems installation and checkout.

   b. TABLE II. A compilation of FARR's against structural assemblies.

4. GLOSSARY. A list of terms, abbreviations and phrases used in the NEIR text, with a brief definition.

1.3 Stage Functional Description

A detailed systems analysis is beyond the scope of this report. The "S-IVB-501 Stage End Item Test Plan", 1B59261, contains a description of each operational system, and includes a listing of Test Procedures, with the objective and prerequisite of each test. Stage 501 is primarily a booster stage, consisting of propellant tanks, feed lines, electrical and pneumatic power for operation of stage systems, and such systems as are required for checkout purposes, loading and unloading control, in-flight control and pressurization, and data measurement during these operations.

1.4 Documentation

1.4.1 Data

Manufacturing and test records for this stage include Fabrication Orders (FO's), Assembly Outlines (AO's), Failure and Rejection Reports (FARR's), Serial Engineering Orders (SEO's), Radiographic Inspection Records, Hydrostatic test data, Vertical Checkout Laboratory (VCL) test data, STC test data, and vendor data. FO's and AO's record in sequence all manufacturing processes, procedures, and Quality Control inspection activities. Any discrepancy from a drawing requirement is recorded on a FARR by Inspection and Test personnel. The FARR is also used to record the Material Review Board (MRB) disposition applicable to the discrepancy. SEO's are written to define the rework required by the FARR or to change the effectivity, or other drawing requirement. Radiographic Inspection records of all weld seams and their X-ray photographs are maintained on file by the contractor. All original data is retained in the contractor's Reliability Assurance Department Central files. Vendor technical data is received on functional purchased parts and retained in Central Data files. The majority of

1.4.1 (Continued)

documentation referenced within this report is included in the log book which accompanies each stage.

1.4.2 Turnover

1.4.2.1 Douglas Space Systems Center

Turnover of the Saturn DSV-4B-1-1 (S-IVB-501) Stage, for transport to Douglas STC, was made 3 March 1966 at Douglas SSC, Huntington Beach. Conditional acceptance was made by the Air Force Plant Representative, Quality Assurance Division Representative. A letter, A3-131-12.30.8.2-L-448, dated 3-9-66, from the Douglas Contracts Manager to the NASA/MSFC Resident Management Office (I-CO-SO) covered the submittal of documentation for purposes of technical turnover of the stage to STC. A copy of that letter and accompanying documentation is included in the stage log book (reference Vol. 1, Part 1, Section 1).

1.4.2 Sacramento Test Center

Turnover of Stage 501 was made 12 August 1966 at STC. Final acceptance was made by the Air Force Representative, Quality Assurance Division Representative, by DD 250 (packing sheet No. SM-33225-6). Letters, A45-870-L32, A3-131-5.9-11.8-L-2080, dated 9 August 1966, from Douglas Management at STC to the NASA Resident Manager at STC submitted the documentation necessary to effect turnover. A copy of this letter and the accompanying documentation is included in the Stage Log Book.

The APS modules have been stored at STC/VCL, temporarily, and will be shipped separately at a later date.

1.4.3 Age Requirements

Certain components of the Stage 501 systems have age requirement factors. Data defining the requirements, and records relative to age items, replacement schedules, and storage procedures, are on file at SSC.

SECTION 2

SYSTEM TEST SUMMARIES

2.0 System Test Summary

The following paragraphs present a narrative summary of manufacture and stage checkout of the S-IVB-501 Stage. Stage checkouts conducted at the Sacramento Test Center (STC) and the Space Systems Center (SSC) are summarized in paragraphs 2.1 and 2.2 respectively, and the manufacture and associated testing of the stage are summarized in paragraph 2.3. Detail narration of the stage checkouts at STC and SSC is presented in section 4.

2.1 Stage Checkout - Sacramento Test Center (STC)

The Stage 501 acceptance test program, conducted at the Sacramento Test Center, verified the functional performance of the stage systems, at sea level conditions, during static acceptance firing and simulated coast phase. The S-IVB-501 Stage Acceptance Firing Test Plan, SM 47377, delineated the general philosophies of the STC test program; and Test Request 1041, S-IVB-501 Stage Acceptance Firing - Revision 1, authorized the acceptance firing and depicted the test objectives and requirements. Stage preparation included the performance of prefire checkouts designed to ensure a condition of readiness for the stage, facility, and ground support equipment to conduct a successful static acceptance firing program.

Test Request 2075, Confidence Test Firing - APS Module No. 1; and Test Request 2076, Confidence Test Firing - APS Module No. 2 authorized the respective APS Module acceptance firings and delineated the test objectives and requirements.

2.1.1 Prefire Activity

The Stage arrived at the Sacramento Test Center on 15 March 1966 and was installed in the Beta Complex, Test Stand I, on 21 March 1966. The prefire checkouts, conducted per the respective handling and checkout procedures, were catagorized as follows for documentary presentation:

a. Test Preparation.
b. Propulsion system.

2.1.1 (Continued)

c. Electrical/electronic systems.
d. Structural inspection.
e. Common bulkhead vacuum.
f. Thermo-conditioning and environmental control systems.
g. Hydraulic system.
H. Integrated systems.
i. Countdown procedures.

The test preparation procedures convered the installation of the necessary test equipment to perform and monitor the various stage tests, and installation of the thrust structure purging network.

The propulsion system procedures pertained to the manual and automatic checkouts, the leak and functional checks, and the final leak checks.

The electrical/electronic checkouts, consisting of twenty-three procedures, covered the following eleven general systems:

a. Power distribution.
b. Digital data acquisition system.
c. Interface compatibility.
d. Propellant utilization system.
e. Telemetry system.
f. Range safety system.
g. Telemetry and range safety antenna system.
h. Single sideband system.
i. Cryogenic temperature sensor verification.
j. Exploding bridgewire system.
k. Auxiliary propulsion system.

The structural inspection procedure covered the necessary inspections to verify the structural integrity of the stage prior to static firing.

The common bulkhead vacuum procedure pertained to the techniques required to verify the integrity of the common bulkhead and the adjoining LOX and LH_2 tanks.

2.1.1 (Continued)

The thermo-conditioning and environmental procedures pertained to supplying a temperature-controlled environment and adequate purges to forward skirt, aft skirt, and interstage assemblies.

The hydraulic system procedures covered the manual and automatic operational modes to verify the capability of the stage hydraulic system to gimbal the J-2 engine upon command.

The integrated systems procedure pertained to the state of readiness of the stage, test stand pneumatic consoles, and associated ducts and cables to conduct propellant loading and acceptance firing.

The countdown procedure covered all facets of testing to verify the stage activities to conduct a successful static acceptance firing, subsequent propellant off-loading, and stage securing.

The prefire checkout procedures for the Auxiliary Propulsion System Modules 1005-1 and 1005-2 verified the following for each module:

a. Interface electrical checkout.
b. Propulsion system test preparation and checkout.
c. Countdown procedure and confidence firing.

Completion of the auxiliary propulsion system prefire checkout procedures resulted in successful static acceptance firings for Module 1005-1 on 6 May 1966 and for Module 1005-2 on 13 May 1966.

2.1.2 Acceptance Firing

The static acceptance firing activity for the stage was controlled by two separate countdown attempts, numbers 614061 and 614063.

a. Run 1A, conducted on 19 and 20 May 1966, achieved 50 seconds of mainstage operation before engine cutoff as a result of a SIM interrupt.

   Run 1B was initiated after test stand inspection, but aborted due to a leakage condition of the cold helium crossover pneumatic valve in console B.

2.1.2 (Continued)

b. Run 2A, accomplished on 25 and 26 May 1966, achieved a successful static firing which consisted of a first burn period of 150 seconds, a simulated coast period of 1.5 hours, and a second burn period of 300 seconds.

The static acceptance firings for the APS Modules were conducted without incident on 6 May 1966 (S/N 1005-1) and 13 May 1966 (S/N 1005-2).

2.1.3 Post-Fire Activity

The post-fire activity on this stage was divided between the test stand in the Beta Complex and the vehicle checkout laboratory (VCL).

The test stand checkouts included:

a. Propulsion system.
b. Hydraulic system.
c. Structures inspection.
d. Thermo-conditioning and environmental control system.

The propulsion system tests included leak checks, a system automatic checkout, an engine alignment, and a test equipment removal procedure.

The hydraulic system checkouts covered an automatic test and a manual system operation and securing operation.

The stage structural test verified structural integrity subsequent to static firing.

The thermo-conditioning and environmental tests pertained to the forward skirt thermo-conditioning checkout and the forward and aft skirt purge.

The VCL stage checkouts consisted of the following:

a. Installation test preparation.
b. Propulsion system.
c. Electrical/electronic systems.
d. Thermo-conditioning and environmental control system.
e. Hydraulic system.

2.1.3 (Continued)

f. All systems test.

g. Weigh and balance procedure.

The installation test preparation checkout covered the test equipment installation necessary to conduct the required test sequences.

The propulsion system checkouts included a manual control check, a leak check, and a manual and automatic test for the auxiliary propulsion system setup.

The electrical/electronic tests consisted of seventeen separate procedures catagorized as follows:

a. Power distribution tests.

b. Digital data acquisition system tests.

c. Propellant utilization system tests.

d. Telemetry system tests.

e. Range safety system tests.

f. Single sideband system tests.

g. Exploding bridgewire system tests.

h. Electro-magnetic compatibility check.

The thermo-conditioning and environmental checks covered the stage forward skirt thermo-conditioning operation, as well as the aft skirt and interstage purge test.

The hydraulic system checkout pertained to the system setup, operation, and securing.

The all systems test verified the operational capability of the stage to function in the simulated flight mode with the electrical umbilicals disconnected at simulated launch.

The weigh and balance check determined the total stage weight, as well as the stage center of gravity point.

The post-fire checkouts for the APS Modules (1005-1 and 1005-2) included a disassembly/reassembly check, a decontamination check, an electrical control system check, and a propulsion system check.

2.2 Stage Checkout, SSC/VCL

The stage was placed in the checkout tower on 15 November 1965 and prepared for systems tests. Checkout operations started on 22 November 1965 and continued in parallel with manufacturing operations until 29 January 1966. Work was active for 65 days after the stage entered the tower. Checkout was active for 43 of the 65 days. Detailed narration on all tests conducted will be found in paragraph 4.2, with six major areas of testing being covered. These areas are:

a. Umbilical mechanical mating.
b. Environmental control systems.
c. Electrical/electronic systems.
d. Engine alignment.
e. APS simulation.
f. Hydraulic system.

As certain portions of the tests were performed simultaneously, the grouping is arbitrary in order to form a coherent narrative sequence.

The umbilical mating tests, consisting of two procedures, were conducted, and verified the umbilical fit and function.

The environmental control systems tests of the forward skirt thermo-conditioning system, consisting of three procedures, were accomplished satisfactorily with no procedural problems encountered. The system was maintained above dew point and between 70° and 100°F to reduce condensation. The temperature was controlled between 52° and 60°F (flight condition) while the R.F. power detectors were being calibrated.

The hydraulic system tests, consisting of two procedures, were satisfactorily completed after some difficulty with hydraulic leaks, programming, procedure, and data description tape errors and timing changes. There were no stage malfunctions and all known problems were resolved prior to the All Systems Test.

2.2 (Continued)

The electrical/electronic systems tests comprised fourteen procedures which are divided into ten areas. These areas are:

a. Continuity compatibility tests.
b. Power distribution tests.
c. Signal conditioning test.
d. Digital Data Acquisition tests.
e. Exploding Bridgewire test.
f. Propellant Utilization tests.
g. Level sensor and control unit test.
h. Cryogenic temperature sensor test.
i. Telemetry and Range Safety antenna test.
j. Electromagnetic compatibility tests.

Revisions to the procedures were made as required to implement procedure corrections and changes, and to allow testing with the existing equipment shortages. Difficulties and problems encountered were corrected.

The engine alignment procedure was conducted without discrepancy, as was the auxiliary propulsion system (stage portion) checkout. The hydraulic system automatic checkout was also run without functional failures occurring.

A listing of VCL tests included in the end item test plan, which were not run during the VCL testing period, is included.

2.3 Incomplete FARR's

The following listed FARR's were open at STC turnover:

A192195 - Strain gauge, P/N SA-13-125TA-120, S/N S075, on cable assembly, P/N 1B54076-1, had incorrect checkout readings and was removed. A replacement part was not available.

A204807 - Transducer 403MT670, P/N 1B402042-517, S/N D002, was suspected of malfunctioning. The problem was held for disposition at KSC.

A204825 - LOX fill and drain valve, P/N 1A48240-501, leaked and was removed. WRO 2795-R1 contains disposition on replacement parts.

SECTION 3

STAGE CONFIGURATION

2.3 (Continued)

A204829 - Check valve, P/N 1B53920-501, allowed reverse flow. The valve was removed but no replacement part was available.

A204839 - LOX tank relief valve and LH_2 chilldown system check valve leaked and were removed. Replacement parts were not available.

A204845 - Debris was noted in the forward and aft skirt areas. The problem is to be reconsidered at FTC.

A204848 - Transducers, P/N 1A67862-505, S/N's C40, C42, and C97, and P/N 1A67862-501, S/N C57, malfunctioned. Disposition was delayed pending investigation of the problem at FTC.

A204906 - Standoff, P/N 1B37889-557, in the main tunnel area, was debonded. It was removed and rebonded, and the FARR remained open pending examination of the rework.

A204909 - Insulation in the forward and aft dome areas was wrinkled in several places. This problem was held for Engineering disposition.

A205005 - Transducer cable assembly 403MT670, P/N 1B40242-63, was cut. It was removed, but a replacement part was not available.

A205007 - Measurements C210, E103, M023, S070, and S071 were discrepant. The problem was held for disposition at FTC.

A205014 - There was a loose electrical jack on range safety decoder, P/N 50M10698-1. The jack was removed, but a replacement part was not available.

A205020 - Accelerometers 411MT675, P/N's 1A68707-577 and -597, S/N's E096 and E115, malfunctioned. They were removed but could not be replaced due to parts shortages.

3.0 Stage Configuration

The definition of the configuration of the Saturn S-IVB-501 Stage, and all noted variations to the stage, are detailed in the paragraphs of this section. Included are explanations of why each part was a variation, and descriptions of the significant differences between that part and the parts to be used on subsequent stages. Those modifications incorporated prior to final acceptance firing of the stage are also noted.

A tabulation of time/cycles accrued on time/cycle significant stage components is presented.

Scope changes affecting the stage are briefly described, to give a background on the interest of the change, its implementation, and the extent of the incorporation.

Reference to existing contractural configuration control paper is given wherever possible.

3.1 Design Intent Verification

The Engineering Configuration List (ECL) defines the configuration of the stage as Space Vehicle, Manufacturing Serial Number 1005, MSFC identification number S-IVB-501. The ECL document, dated 25 May 1966, revision B, includes a listing of all parts, nonhardware drawings, manufacturing and process specifications required for manufacture and test of the stage as defined by Engineering production drawings, and EO releases. The ECL was transmitted to NASA under a separate cover.

Verification of the Engineering design intent is accomplished by comparing the ECL, the Planning Configuration List (PCL), and the Reliability Assurance Department As-Built Configuration List (ABCL). Any noted discrepancies were resolved by the contractor, and a listing of the resultant action is filed at the contractor's facility.

3.2 Stage Variations

Components and assemblies which are variations to the stage design are identified by SEO dash numbers after the part number, and are detailed in this paragraph. Only serial numbered Flight Critical Items, installed in the stage with SEO's, are reviewed. A description of these variations by part name, number, and serial number, is presented with the applicable SEO's.

3.2 (Continued)

The following components and assemblies have variations, most of which are minor. All components and assemblies are of production configuration unless otherwise specified.

Paragraph	Part Name	Part Number	S/N
3.2.1	Valve, Shutoff, LH_2 Chilldown System	1A49965-511-008A	0303
3.2.2	Module, LOX Pump Purge	1A58347-505-003	023
3.2.3	Mounting Assembly, Sequencer	1B39550-501-008	00002
3.2.4	Mounting Assembly, Power Distribution Aft 56 VDC	1B51211-501-007	0002
3.2.5	Mounting Assembly, Power Distribution Aft 28 VDC	1B51354-501-005 1B51354-501-006	00002
3.2.6	Mounting Assembly, Power Distribution Forward	1B51379-501-006A	00002

3.2.1 Valve, Shutoff, LH_2 Chilldown System (1A49965-511-008A, S/N 0303)

SEO 1A49965-511-008A deleted certain acceptance test and hardware requirements because of a shortage of time. The schedule problem arose because valves, P/N's 1A49965-507 and -509, were reworked to conform to the -511 and -513 configurations.

3.2.2 Module, LOX Pump Purge (1A58347-505-003, S/N 023)

SEO 1A58347-505-003 provided instructions for assembling module, P/N 1A58347-400, and cap, P/N 1B54754-1, normally assembled and installed by the vendor. These operations were necessary because the module was procured from the vendor per WRO S-IVB-091, without provisions for the installation of the cap.

3.2.3 Mounting Assembly, Sequencer (1B39550-501-008, S/N 00002)

SEO 1B39550-501-008 authorized the use of a non-flight part for purposes of vehicle checkout, because flight parts were not available at the time of the test.

3.2.4 Mounting Assembly, Power Distribution, Aft 56 VDC (1B51211-501-007, S/N 0002)

SEO 1B51211-501-007 authorized the use of a non-flight part for system tests, with the restriction that a flight-approved part would be installed prior to static acceptance firing. Approved parts were not available at test time.

3.2.5 Mounting Assembly, Power Distribution, Aft 28 VDC (1B51354-501-005, -006, S/N 00002)

SEO's 1B51354-501-005 and 1B51354-501-006 both allowed the temporary use of non-flight parts, to permit vehicle checkout operations to proceed on schedule. Flight parts were not available.

3.2.6 Mounting Assembly, Power Distribution, Forward (1B51379-501-006A, S/N 00002)

SEO 1B51379-501-006A also permitted non-flight parts to be used in vehicle checkout, providing these parts were replaced prior to firing tests at STC. Flight-authorized parts were short at test time.

3.3 Scope Change (SC) and Engineering Change Proposal (ECP) Verification

Verifications of SC/ECP's which affect the stage have been listed on form DD829-1, which is included in the stage log book. SC's and ECP's which could not be verified prior to stage delivery, because of equipment shortages, have been verified to the extent of completion by Douglas/AFQA personnel, and recorded in the Stage Log Book on a separate form. SC's scheduled for accomplishment after turnover are listed in the Turnover Documentation section of the Stage Log Book. Verification is detailed in the following four paragraphs as SC/ECP's incorporated in the initial design; SC/ECP's incorporated and verified at DAC; SC/ECP's partially verified, being monitored; and SC/ECP's to be incorporated and verified after turnover.

3.3.1 Scope Changes/Engineering Change Proposals Incorporated in the Initial Design

a. SC 1016B, authorized by CCO 21 and 29, deleted the provisions for stage retro-rockets.

b. SC 1024, authorized by CCO 23, provided for a J-2 engine turbopump warm helium purge.

c. SC 1027B, authorized by CCO 40, provided for the incorporation of recirculation type chilldown and prevalve installation.

d. SC 1075B, authorized by CCO 35, 42, and 55, provided for redesign of the propellant tank structure, to meet requirements for increased tank pressurization.

e. SC 1096, authorized by CCO 25, provided for the removal of the fiberglass heat barrier which insulated the forward and aft skirts from the cryogenic propellant tanks.

f. SC 1104A, authorized by CCO 49, 54, 76, 77, 160, 207, and 238, provided for the redesign of the stage umbilical propellant fill and drain couplings.

3.3.1 (Continued)

g. SC 1115, authorized by CCO 51, 117, 250, and 251, provided for implementation of specs concerning vibration, acoustic, and shock tests. Also provided for were redesign of the LOX vent line, and the design and installation of tube clamps for the hydraulic hardlines.

h. SC 1151, authorized by CCO 113, 154, 235, and 356, provided for design changes to allow for increased pressure in the stage hydraulic system.

i. SC 1152, authorized by CCO 98, added a check valve in the GH_2 bleed line.

j. SC 1167, authorized by CCO 237 and 330, provided for the monitoring and checkout of J-2 engine pressure switches and valves.

k. SC 1176, authorized by CCO 79, provided for the incorporation of MC/MF flared tube connectors in the stage.

l. SC 1185, authorized by CCO 125 and 187, provided plug supervision circuits for GSE interface connectors.

m. SC 1195A, authorized by CCO 140, 230, 336, 339, 391, 397, and 407, provided for transducer installation and measurements required for the stage Basic Firing Measuring Program.

n. SC 1204, authorized by CCO 171, 220, 360, and 371, provided for the incorporation and modification of the complete telemetry system.

o. SC 1221A, authorized by CCO 210, provided for the redesign of the APS module for the ullage rocket system.

p. SC 1232A, authorized by CCO 242 and 330, provided for the revision of the stage electrical system to conform to GSE compatibility requirements.

q. SC 1243B, authorized by TD71, provided for acceptance firing the APS modules at STC complex gamma.

r. SC 1266, authorized by CCO 281 and 455, provided for a backup LOX tank pressurization system, independent of the vehicle control system.

s. SC 1276, authorized by CCO 267, 273, and 295, provided for electrical interface connectors and cabling to connect the post-separation transducers in the stage.

t. SC 1277, authorized by CCO 265, provided for the incorporation of an emergency detection system in the stage.

u. SC 1278A, authorized by CCO 271, provided for redesign of the circuitry for coarse loading potentiometers.

v. SC 1282, authorized by MSFC letter I-V-S-64-48, provided an electrical connector bracket for stage to instrument kit connections.

w. SC 1295, authorized by CCO 282, provided for hardwire measurement capability through the umbilical.

x. SC 1306, authorized by CCO 296, provided for drawing changes to reflect the exploding bridgewire unit status change to a government furnished part.

y. SC 1354, authorized by MSFC letter I-CO-SD-L-1205, incorporated the range safety system controller provided by MSFC.

3.3.1 (Continued)

z. SC 1363, authorized by CCO 329, provided incorporation of an on-off control system for the telemetry transmitter.

aa. SC 1364, authorized by CCO 368, 395, 459, and 602, provided for incorporation of modifications called out in the J-2 engine electrical interface document.

ab. SC 1390, authorized by CCO 201 and 341, provided for the removal of telemetering circuits monitoring the APS.

ac. SC 1397, authorized by CCO 351, provided a safing system to ensure against the inadvertent firing of the ullage rocket motors.

ad. SC 1400, authorized by CCO 354, 429, and 508, provided revised channel assignments for mission control data.

ae. ECP X005, authorized by CCO 365 and 406, provided for the allocation of discrete launch signals to separate bilevels on the PCM/DDAS.

af. ECP X043, authorized by CCO 409 and 468, provided individual internal-external control each range safety receiver and EBW firing unit.

3.3.2 Incorporated and Verified Scope Changes/Engineering Change Proposals

No scope changes or engineering change proposals, which were not incorporated in the initial design, were incorporated and verified at the time of stage turnover.

3.3.3 Partially Verified Scope Changes/Engineering Change Proposals

The following SC's/ECP's have been partially verified by Douglas personnel. An active status is being maintained in the stage log books until complete incorporation and verification is accomplished:

a. ECP X190, authorized by NASA letter I-CO-S-IVB-5-762, provided for changes to the forward skirt environmental control system.

b. ECP X199, authorized by CCO 634 and 691, provided for redesign of the APS modules.

c. ECP 0450, authorized by MK/WK, provided for changes in the auxiliary tunnel cover.

3.3.4 Scope Changes/Engineering Change Proposals to be Incorporated and Verified after Turnover

The following SC's/ECP's will be verified after turnover of the stage:

a. SC1045B, authorized by SA350 and CCO 118, documented the design criteria for the Douglas evaporative heat transfer system, used to condition the NASA instrument unit and the S-1VB forward skirt electronic components.

3.3.4 (Continued)

b. SC 1124, authorized by CCO 259, provided closed loop checkout capability to enable closed loop checkout of the S-1VB command RF system in the Vertical Assembly Building at KSC.

c. SC 1153A, authorized by CCO 163 and 280, provided for redesign and modification of the propellant dispersion system, to enable the components of the system to be installed in a minimum amount of time under conditions which will prevail during prelaunch at KSC.

d. SC 1187, authorized by CCO 136, 172, and 330, and letter CL 64-89, provided for the installation of MSFC furnished control accelerometer and rate gyros.

e. SC 1189, authorized by CCO 111 and 126, provided for the parts and documents for the translunar coast.

f. SC1193, authorized by CCO 156, provided for the redesign of the LOX tank vent line and supporting hardware.

g. SC1203, authorized by CCO 168, provided for LOX and LH_2 turbopump RPM measurement.

h. SC 1207, authorized by CCO 197, 213, 330, 343, and 414, provided for modification of the propellant utilization system.

i. SC 1218, authorized by CCO 202 and 330, defined recirculation pump procurement requirements.

j. SC 1219, authorized by CCO 201, provided for the removal of the telemetry circuits which monitor the application of voltage to the quad-poppet valve solenoids in the APS modules.

k. SC 1241, authorized by CCO 222, provided an additional sensing and associated wiring in the LOX and LH_2 tanks for the J-2 engine cutoff system.

l. SC 1247, authorized by CCO 227, provided a mounting bracket for the EBW units and pulse sensors.

m. SC 1274, authorized by CCO 264 and 330, provided short circuit protection for the stage power supplies.

n. SC 1297A, authorized by CCO 284, provided for design modification of the forward skirt for venting purposes.

o. SC 1304, authorized by CCO 288, provided for redesign and manufacture of the LH_2 tank for pressurization reduction.

p. SC 1326, authorized by CCO 279 and 595, added the requirement for differential pressure measurements across the LH_2 and LOX recirculation pumps.

q. SC 1344, authorized by CCO 210 and D134, provided specifications for the "LEM" oxidizer tank assembly.

r. SC 1376A, authorized by CCO 395 and 467, provided for the reduction of trapped propellants at burnout.

3.3.4 (Continued)

s. SC 1383A, authorized by NASA letter I-CO-SD-4-1616, provided for the design and development of dual diaphragm switches.

t. ECP X008, authorized by CCO 257 and 362, provided for the installation of additional strain gauges.

u. ECP X009, authorized by CCO 374 and 430, provided modifications to the LH_2 orbital experiment.

v. ECP X021, authorized by CCO 363, provided for static test monitoring of the engine turbopump RPM.

w. ECP X039, authorized by CCO 394 and 471, provided for production vibration test of pressure switches.

x. ECP X071, authorized by CCO 668 and 669, provided for modification of the telemetry calibrator.

y. ECP X082, authorized by CCO 434 and 539, instituted engine transducer design requirements.

z. ECP X083, authorized by CCO 438 and 568, provided for additional telemetry measurements.

aa. ECP X085, authorized by CCO 444, provided for redesign of the engine cutoff circuitry.

ab. ECP X092, authorized by CCO 451, provided for interface connections.

ac. ECP X099, authorized by CCO 461, provided for additional umbilical hardwire measurements.

ad. ECP X109, authorized by CCO 476 and 524, provided for stage measurement changes.

ae. ECP X113, authorized by CCO 472 and 539, provided a method for implementing the secure range safety command system.

af. ECP X117, authorized by CCO 488, 547, 622, and 665, provided for installation of an instrumentation probe and a quality meter.

ag. ECP X119, authorized by CCO 502 and 586, provided design modifications for venting the LH_2 tank.

ah. ECP X124, authorized by CCO 506, 539, and 562, provided stage changes, as required, for Rocketdyne ECP compatibility.

ai. ECP X134, authorized by CCO 526, 537, 573, and 636, provided for the redesign of the J-2 engine/stage electrical interface, and redesign of the customer connect panel.

aj. ECP X136, authorized by CCO 329, 538, and 631, provided for a common stage coolant system.

ak. ECP X137, authorized by NASA letter I-V-S-TD-65-53, defined the programmed mixture ratio.

3.3.4 (Continued)

al. ECP X152, authorized by NASA letter TD65-78, provided purge requirements for the J-2 engine.

am. ECP X165, authorized by CCO 567, provided for programming of launch control measurements.

an. ECP X171, authorized by CCO 79 and 582, provided for flared tubing for the stage.

ao. ECP X176, authorized by CCO 587, provided modifications to the thrust structure.

ap. ECP X188 provided measurements for the secure command system.

aq. ECP X198, authorized by CCO 658 and 692, revised the engine thrust OK circuits.

ar. ECP X209, authorized by NASA letter TD65-96, revised forward skirt paint requirements.

as. ECP X217, authorized by CCO 698, provided for black teflon hoses for the stage hydraulic system.

at. ECP X222, authorized by TD 66, modified the LOX and LH_2 tank probes.

au. ECP X224, authorized by CCO 739, provided recirculation chilldown pump pressurization measurements.

av. ECP X239, authorized by CCO 729, provided implementation of safing engine start circuits.

aw. ECP X248, authorized by CCO 760, provided for installation of aluminum tape/sheet for use in the cold plates.

ax. ECP X252, authorized by NASA letter I-CO-S1VB-6-63, provided a shot peening requirement for the APS oxidizer tanks.

ay. ECP X255, authorized by NASA letter I-CO-S1VB-6-130, provided for the design and installation of thermal insulation for the Model 11 switch selectors.

az. ECP X262, authorized by NASA letter I-CO-S1VB-6-198, modified the EDS cutoff circuits.

ba. ECP 0271, authorized by CCO 798, provided additional measurements for the range safety system.

bb. ECP 0277, authorized by CCO 801, deleted the dispersion system pyrotechnic connection.

bc. ECP 0278, authorized by CCO 809, rechanneled telemetry measurements to change sample rates.

3.4 Waivers and Deviations

The following is a list of waivers and deviations that comprise part of the stage turnover documentation to FTC. The stage waivers and deviations are reflected as Enclosures 2 and 3 of Douglas STC Turnover Documentation letter forwarded to NASA STC Resident Manager. A copy of subject letter and documentation are included in the stage log book.

3.4.1 Waivers

The following is a list of specifications which pertain to S-1VB Stage 501, and have been affected by the noted Waiver Requests:

SPECIFICATIONS	WAIVERS
MSFC-DWG-50M60061	4B-43
1P00065	-58
1P00066	-58, -65
MSFC-PROC-158A	-66, -75, -76, -77, -87
MSFC-MC-146	-74
M1L-STD-453	-82
MSFC-DWG-10509386	-83
M1L-R-11471	-84

3.4.2 Deviations

The following is a list of specifications which pertain to S-IVB Stage 501, and have been affected by the noted Deviation Requests:

SPECIFICATIONS	DEVIATIONS
MIL-P-5518B	4B-224
MIL-W-8604, Amendment 1	-131
MIL-P-19692A	-194
MIL-U-25475A	-150, -152, -153, -225
MIL-U-70327, Amendment 1	-335, -357
MSFC-SPEC-143	-307
MSFC-PROC-158A	-70, -71, -86, -90, -96, -100, -104, -226, -254, -274, -311, -447, -449, -469, -534
MSFC-SPEC-164	-163, -167, -168, -227, -240, -241, -243, -258, -410
MSFC-PROC-166A	-215, -264, -265, -266, -475, -477
MSFC-PROC-196	-253
MSFC-PROC-252	-159, -160, -161, -162, -221, -567
MSFC-PROC-293	-195, -197, -198, -199, -213, -250, -277
ABMA-PD-W-45A	-130
ABMA-PD-E-53	-284, -500
ABMA-PD-C-711A	-492
MIL-STD-442	-289
MSFC-STD-100	-247
MSFC-STD-156	-1, -2, -3, -4,-48, -49, -60
MSFC-STD-163	-111, -118, -119
MSFC-STD-204A	-156
MSFC-STD-271	-454, -457, -458, -459, -462, -528
MSFC-MC-347	-239

3.4.2 (Continued)

SPECIFICATIONS	DEVIATIONS
ABMA-STD-4288	4B-252
MSFC-DWG-10301617	-179
MSFC-DWG-10M81618	-174, -175, -176, -177, -178, -251, -412
MSFC-DWG-10443377	-123
IN-P&VE-8-63-2	-498
ABMA-DSN-TN-3-59	-230, -231, -233, -234, -235, -316, -327, -328, -329, -330, -331, -332
SM-41411 (9709486)	-298
SM-41411 (1P20050)	-299
SM-41411 (1P00066)	-300
SM-41411 (1P20030)	-302
SM-41411 (1P00085)	-303
SM-41411 (1P20083)	-314
SM-41411 (1P20006)	-315
SM-41411 (1P20001)	-351
SM-41411 (MSFC-PROC-166A)	-353
SM-41411 (1P00065)	-409
SM-41411 (1P20075)	-411
SM-41411 (1P20074)	-448
SM-41411 (9709481)	-465
SM-41411 (9709457)	-466
SM-41411 (1P00092)	-478
SM-41411 (1P00077)	-481
SM-41411 (1P20011)	-483
SM-41411 (1P20056)	-484
SM-41411 (1P00068)	-491
SM-41411 (1P00011)	-518
SM-41411 (1P20025)	-519

3.4.2 (Continued)

SPECIFICATIONS	DEVIATIONS
SM-41411 (1P00066)	4B-512
SM-41411 (9709014)	-517
SM-41411 (1P00036)	-520
SM-41411 (1P00059)	-526
SM-41415	-364
SM-41568	-527
R-3825-1	-532

3.5 Reliability Time/Cycle Significant Items

Twenty items on Stage 501 are designated as time and/or cycle significant. These items are detailed in drawings 1B 55425H and 1B 55423D, which define the meaning of cycles and hours as applied to the individual components.

The total number of J-2 engine gimbal cycles exceeded 100 per cent of the total acceptable. However, this was acceptable because the vast majority of the cycles were of a "small angle" nature. Calculation of this percentage for future stages will take this into account. FARR A204919 was written reflecting this problem, and noting that 32 per cent of the cycles were registered when the computer locked up during the integrated systems test.

A tabulation of the accrued time/cycles on Stage 501 components appears on the following pages.

TABULATION OF TIME/CYCLE SIGNIFICANT ITEMS

PART NAME & PART NUMBER	SERIAL NUMBER	ENGINEERING LIMITS	ACCUMULATED MEASUREMENT	REMARKS
G.F.P (1B55423-D)				
50M10697 - Command Receiver, (MCR 503)	0022	Not specified	37.55 Hours	
50M10697 - Command Receiver, (MCR 503)	0049	Not specified	33.65 Hours	
50M10698 - Decoder, Range Safety Control	0022	Not specified	37.55 Hours	
50M10698 - Decoder Range Safety Control	0045	Not specified	30.38 Hours	
103826 - J2 Engine (for gimbal cycles)	J-2031			This data includes all engine gimbal cycles at STC plus cycles brought forward from A-3 and Rocketdyne records. The cycle data is expressed as a percentage of Design Limits expended based on the gimbal angle and can vary from 250 to 10,000 + cycles as noted. *The indicated percentage was computed from the Engine Log Records utilizing the graph per R/NAS Rocket Engine Data Manual R-3825-1 Page No. 9-36 and 9-37.
a) Customer connect lines and inlet ducts		250--10,000	47.72 %*	
b) Gimbal bearing		250--10,000	109.52 %*	
c) Firing time		3750 sec.	957.9 Sec.	
Reliability (1B55425-H)				
1A66241-50 Pump, Hydraulic, Auxiliary Motor Driven	X454602	120 Hours 300 Cycles	3 Hours 96 Cycles	
1A48858-1 Spheres,	1038 1042 1048	@ @ @	9 Cycles 8 Cycles 8 Cycles	@ No upper limit for cycle life has been established for these spheres.

SECTION 4

DETAILED NARRATIVES

TABULATION OF TIME/CYCLE SIGNIFICANT ITEMS

PART NAME & PART NUMBER	SERIAL NUMBER	ENGINEERING LIMITS	ACCUMULATED MEASUREMENT	REMARKS
1A48858-1 Spheres, (Continued)	1054	@	8 Cycles	
	1062	@	8 Cycles	
	1076	@	8 Cycles	
	1082	@	8 Cycles	
	1086	@	8 Cycles	
1A59562-1 Potentiometer, Bridge, R1	1005	2,000 Cycles	582 Cycles	
1A59562-1 Potentiometer, Bridge, R2	1006	2,000 Cycles	380 Cycles	
1A39468-1 Tank Assembly, S-V, Bladder Expulsion, APS	35-3	20 Cycles	3 Cycles	
1A39468-1 Tank Assembly, S-V, Bladder Expulsion, APS	4	20 Cycles	3 Cycles	
1A39468-2 Tank Assembly, S-V, Bladder Expulsion, APS	17-3	20 Cycles	3 Cycles	
1A39468-2 Tank Assembly, S-V, Bladder Expulsion, APS	4	20 Cycles	3 Cycles	

* Range safety control decoder, P/N 50M10698, S/N 0022, was removed prior to turncver per FARR's A205014 and A205015. The decoder is to be replaced at KSC.

4.0 Detailed Narrative - Stage Checkout

A detailed narration of stage checkout is presented in this paragraph. The major subparagraphs comprising the detailed narrative are: 4.1 Stage Checkout - STC; 4.2 Stage Checkout - SSC; and 4.3 Stage Manufacturing Tests. Each of these major subparagraphs is further subdivided to the degree required to present a complete historical record of the stage checkout.

Permanent nonconformances and functional failures affecting the stage have been recorded on FARR's, and are referred to by serial number throughout this paragraph (e.g. FARR A159426). Those FARR's referred to in paragraph 4.1 are presented, in serial number (numerical) order, in section 1 of table I; and those referred to in paragraphs 4.2 and 4.3 are similarly presented in section 2 of table I.

4.1 Stage Checkout - STC

Checkout of the stage at STC began in March 1966, and was successfully completed by August 1966. The handling and checkout procedures were performed to meet the test objectives outlined in Test Request 1041, Stage Acceptance Firing. Two countdown attempts were required to attain a successful acceptance firing of the stage. The prefiring and post-firing "as run" procedures reviewed under this paragraph were included as part of the SIVB/5 Flight 1005 Stage Log Book.

The APS attitude control control modules were tested separately to the requirements of Test Request 2075, Confidence Test Firing, APS Module 1005-1, Complex Gamma. The APS "as run" procedures reviewed under this paragraph were also included as part of the S-IVB-501 Stage Log Book.

4.1.1 Test Preparation

Two procedures were conducted to prepare the stage for prefire checkout. These were:

a. Installation test preparation.
b. Thrust structure purge system installation.

4.1.1.1 Installation Test Preparation Document (1B70422 N/C)

Test Explanation

The purpose of this checkout procedure was to verify the configuration and performance of the stage propulsion test installations required for the static test preparation of the stage.

4.1.1.1 (Continued)

Test Review

This test preparation procedure, initiated on 24 March 1966 and accepted on 19 May 1966, verified the stage propellant system test installations for the pre-static acceptance tests, static firing test, and the post static checkouts in the test stand, Beta complex. The specific checkouts and calibrations included:

a. Orifice flow calibrations.
b. LH_2 and LOX tank pressurization module calibration, and the LOX chill-down pump purge module calibration.
c. LH_2 propulsive and nonpropulsive vent purges, and the LOX vent and relief purge.
d. Connection of ground lines to the stage (umbilical, vent, and pneumatic connections).
e. Vehicle monitor panel connections.
f. LH_2 and LOX tank auxiliary pressurization system connections.
g. Forward and aft umbilical carrier purge connections.
h. Prevalve ground control connection.
i. LH_2 prevalve shaft seal drain connection.
j. Diffuser installation.
k. Ground support equipment pressure switch checks. (Engine bell extension water pressure switch and the gaseous hydrogen ignitor pressure switch).
l. LOX and LH_2 repressurization system isolation.
m. LOX and LH_2 chilldown inverter and LH_2 regulator shutoff isolation.

Thirty-one revisions were written to the test installation procedure. Twenty-seven provided additional instructions for the hook-up, checkout, and removal of the permanent and temporary component installations required to verify the stage systems; two pertained to ensuring the integrity of the vacuum system setup; one revision provided instructions to inspect the J-2 engine injector face prior to the installation of the engine throat plug; and one revision deleted a procedure step no longer required for this procedure.

No discrepancies were noted against this procedure.

4.1.1.2 Thrust Structure Purge Installation (1B60254 D)

Test Explanation

This procedure provided the instructions to install the Model 742 environmental

4.1.1.2 (Continued)

control systems test hardware in the aft skirt area of the stages.

Test Review

This checkout procedure, performed and accepted between 13 and 19 May 1966, verified the installation of the thrust cone purge system. The installed test hardware sealed purge gas leakage sources, furnished additional purge gas to the thrust cone area to ensure complete oxygen evacuation, and replaced flight hardware during the static firing.

Two revisions were written to this procedure: One deleted procedural steps no longer required for this checkout procedure; and one omitted the fairing spacers from the chilldown pump fairing installation, to prevent an interference problem between the internal rib of the fairing cover and a 1/4 in. tube assembly.

There were no discrepancies on record.

4.1.2 Propulsion System Tests

Four test procedures were conducted to determine the prefiring condition of the stage propulsion system. These procedures were:

a. Propulsion system manual checkout.
b. Propulsion system automatic checkout.
c. Leak and functional checks.
d. Final propulsion system leak check.

4.1.2.1 Stage and Manual Ground Support Equipment Manual Controls Check (1B70420 NC)

Test Explanation

The purpose of this procedure was to provide instructions for verifying the manual mode control of the pneumatic components in the stage propulsion system and the associated ground support equipment. Included for functional checks were the pneumatic regulators, solenoid valves, and pneumatic valves on the stage, support equipment consoles A, Model DSV-4B-319, P/N 1A98160, and the LH_2 and LOX control skids.

Test Review

This checkout procedure, initiated on 2 April 1966 and accepted on 29 April 1966,

4.1.2.1 (Continued)

verified the manual control of the pneumatic components of the stage propulsion system, and associated ground support equipment. The verification consisted of supplying the electrical and/or pneumatic signals to the respective system components and monitoring the response for comparison with design parameters.

Two revisions were written to this procedure: One deleted the procedural steps accomplished by another H&CO, and the second revision altered the test sequence to perform a pre-valve check at the stage umbilical level, rather than at the ground support level.

There were no discrepancies on record.

4.1.2.2 Propulsion System Test (1B62753 NC)

Test Explanation

This checkout procedure defined the automatically programmed sequence of events required to verify capability of the propulsion system to function, in accordance with design parameters, prior to static acceptance firing.

Test Review

This test, performed on 7 May 1966 and accepted on 10 May 1966, verified the integrated electromechanical operational capability of the stage propulsion system. The sequence of tests included:

a. Pressure switches were pressurized to the actuation pressures and results monitored.

b. Pneumatic control system components, LOX tank pressurization system components, and LH_2 tank pressurization system components were operated individually for functional capability verification and fault isolation.

c. J-2 engine system was divided into four phases for functional testing:

   1. Phase 1 tested the spark ignition system.

   2. Phase 2 checked the engine logic and delay timers.

   3. Phase 3 pressurized the engine control helium bottle, and cycled each engine valve through to normal sequence.

   4. Phase 4 combined phases 1, 2, and 3 to demonstrate the engine system.

A total of forty-five revisions were written against this procedure: Thirty-seven revisions corrected errors in the program, dictionary, or the test requirement drawing; five revisions increased delay times to ensure complete response coverage; two revisions accepted out-of-tolerance measurements as not detrimental; and one

4.1.2.2 (Continued)

revision repeated a step. There were no failure reports written against this procedure.

Test Review (Run 1A)

This procedure, conducted and accepted on 19 May 1966 as Task 14 of Countdown Manual 1B60567, re-verified the integrated electro-mechanical functional capability of the stage propulsion system, prior to stage acceptance firing. The components and systems re-verified included the pressure switches, pneumatic control system, LOX and LH_2 tank pressurization systems, and the J-2 engine system.

Fifteen revisions were written to this task: Thirteen corrected errors in the program, dictionary, or the test request document; one increased the response time on the engine valve solenoid relays to ensure complete measurements; and one revision deleted the requirement to check the mainstage pressure switches as not part of the sequence and aborts test.

Test Review (Run 2A)

Run 2A, performed and accepted on 25 May 1966, verified that the propulsion system was capable of functioning in accordance with design requirements prior to the acceptance firing test. Re-verified were the pressure switches, pneumatic control system, LOX and LH_2 tank pressurization systems, and the J-2 engine system.

A total of sixteen revisions were written to this procedure: Fourteen corrected program, dictionary, or test request document errors; one increased the response time on the engine valve solenoid relays to ensure complete measurement of the engine valve times; and one revision deleted the requirement to check the mainstage pressure switches.

4.1.2.3 Propulsion System Leak Check (1B70410 NC)

Test Explanation

This checkout procedure defined the test sequences required to certify the integrity of the stage propulsion system for static acceptance firing.

The test sequences included:

a. Equipment setup.

4.1.2.3 (Continued)

b. Pressure switch checks.

c. Stage proof checks.

d. Stage pneumatic system leak and functional checks.

e. Turbopump torque checks.

f. Engine start bottle leak checks.

g. Engine check valve reverse flow checks.

h. Engine gas generator and exhaust system leak checks.

i. Engine pump purge leak and flow checks.

j. Engine thrust chamber leak check.

k. Engine pneumatic leak and functional checks.

l. LH_2 tank pressurization system leak and functional checks including pressure switch functional checks.

m. LOX tank pressurization system leak and functional checks.

n. LOX tankage leak and flow checks.

o. LH_2 tankage leak and flow checks.

p. LH_2 and LOX vent system leak checks.

Test Review

This procedure, initiated on 6 April 1966 and accepted on 12 May 1966, verified the integrity of the stage for propellant loading and static acceptance firing. The stage propulsion system conformed physically to B/P 1A38318-517, propulsion system installation, complete.

A total of seventy revisions were written to this procedure: Sixty-two pertained to instructions delineating the temporary connections and removal for test hardware to facilitate the leak and functional tests, and the subsequent return to the original configuration; four revisions covered the rerun of tests to verify results; three revisions deleted steps previously accomplished; and one revision provided instructions to perform the leak and functional checks on the auxiliary propulsion system.

Seventy-one entries were noted on the leak check log: Sixty-three revisions pertained to items that were corrected by replacing seals and/or sleeves, retorquing, or accepting the noted leaks as not detrimental to the system or test; seven entries were corrected by rewelding the discrepant areas; and one item was corrected utilizing a flex hose connection.

4.1.2.4 Final Propulsion Leak Checks (1B70407 NC)

Test Explanation

This checkout procedure defined the final leak check test sequences required to certify the integrity of the stage propulsion system for static acceptance firing. The sequence of tests included:

a. Console valve integrity check.
b. Stage pneumatic system leak check (helium).
c. Cold helium system leak check (helium).
d. LOX and LH_2 tankage leak check (halogen).
e. Engine thrust chamber leak check (helium).
f. Engine pneumatic leak and functional checks.
g. Gaseous nitrogen crossover removal.
h. System purges.

Audible methods were employed to detect major leaks; and bubble solution (compatible with LOX systems), observance of pressure drops within prescribed time limits, and halogen or helium leak detectors were utilized to detect minor leakages.

Test Review Run 1

This test, conducted and accepted between 13 and 20 May 1966, verified the propulsion system design integrity and functional capability to undergo propellant loading and static acceptance firing.

Thirteen revisions were written to this procedure:

a. Reconnect flex hoses to complete tests interrupted by the proofing of static firing tapes.
b. Reconnect the LH_2 and LOX repressurization pipe assemblies to conduct the proofing of static firing tapes.
c. Instructions to perform the engine pneumatic leak and functional per the current techniques (H&CO 1B70410, Propulsion System Leak Checks).
d. Instructions to rerun portions of the test to reverify the results obtained during the console valve integrity check.
e. Instructions to perform a leak check on the LH_2 prepressurization valve, console B, prior to wrapping.
f. Install a flex hose (1500 psi minimum) in the LH_2 chilldown shutoff valve actuation line to accomplish actuation of the LH_2 chilldown valve (return to original configuration with tube assembly, P/N 1B52511-1, prior to static firing).

4.1.2.4 (Continued)

g. Verify the samples of freon from the LH_2 and LOX tanks meet the required minimum standard to accomplish valid leak checks (equal to or greater than 1/2 of 1 per cent).

h. Instructions to perform leak checks of the thrust chamber supply line to the manifold, and the reverse flow of the thrust chamber supply check valve.

i. Instructions to perform the engine start bottle decay check.

j. Verify the thrust chamber quick disconnect flow rate, utilizing an ambient gas flow through the thrust chamber system.

k. Instructions to connect purge lines required for static acceptance firing.

l. Delete the gas generator and turbopump seal cavity purge requirement (required for recycle only).

m. Delete the requirement to vent the control helium sphere during securing activities.

Thirty-one entries were noted on the leak check log for this checkout procedure: Seventeen items pertained to acceptable leak conditions not detrimental to the test or system; thirteen items were corrected by replacing seals and/or retorquing the connections; one item pertained to the removal and replacement of a valve in the ground support equipment that leaked excessively.

Test Review (Run 2)

This run, performed and accepted between 23 and 25 May 1966, verified the propulsion system integrity and subsequent to countdown, run 1A, and prior to countdown, run 2A.

A total of fifteen revisions were written to this checkout procedure:

a. Two pertained to pressurizing the thrust structure for leak checks - one utilizing the GSE console and one bypassing the console.

b. Portions of the procedure not required for the recycling operation were deleted.

c. Instructions to install a flex line from the GSE helium supply to the first stage helium discharge line, bypassing the helium regulator normally installed but temporarily removed at test time, were added.

d. Decay check on the pneumatic system in lieu of the individual leak checks not required for recycling operation was performed.

e. Three revisions pertained to sampling the freon content of the LOX and LH_2 tanks to ensure a sufficient quantity to perform valid leak checks.

f. Instructions were given to install a flex line in the LH_2 fill and drain open acuation line for the LH_2 tank leak check.

4.1.2.4 (Continued)

g. Leak check of the transfer system from the LH_2 sled to the LH_2 fill and drain valve was performed.

h. Instructions were given to check the LOX chilldown pump purge system to ensure an adequate purge.

i. Instructions were added to install the pneumatic valve, P/N 1A66600-519, as the cold helium crossover, in place of pneumatic valve, P/N 1A66600-513.

j. Leak checks of the LH_2 feed and recirculation ducts, prior to installing the fairing covers, were performed.

k. Procedural steps no longer required for this test were deleted.

Ten entries were noted on the leak check log: Five items pertained to leakage conditions that were acceptable as not detrimental to the system or checkout; four items were corrected by replacing seals and/or retorquing loose connections; and one item pertained to a leakage condition that subsequently rechecked satisfactorily after cycling the component three times.

There were no discrepancies recorded during this procedure.

4.1.3 Electrical/Electronic Systems Tests

This paragraph is divided into thirteen subparagraphs for presentation. Each subparagraph concentrates on one area of interest, and is further subdivided, as necessary to detail all checkouts run on each electrical/electronic system. The major subparagraphs are:

a. Power distribution tests - paragraph 4.1.4.1.
b. Digital data acquisition system tests - paragraph 4.1.3.2.
c. Level sensor and control unit calibration - paragraph 4.1.3.3.
d. Signal conditioning setup - paragraph 4.1.3.4.
e. Compatibility checks - paragraph 4.1.3.5.
f. Propellant utilization system tests - paragraph 4.1.3.6.
g. Telemetry system tests - paragraph 4.1.3.7.
h. Range safety system tests - paragragh 4.1.3.8.
i. Telemetry and range safety antenna system checkout - paragraph 4.1.3.9.
j. Single sideband system tests - paragraph 4.1.3.10.
k. Cryogenic temperature sensor verification - paragraph 4.1.3.11.
l. Exploding bridgewire system automatic checkout - paragraph 4.1.3.12.
m. Auxiliary propulsion system automatic checkout - paragraph 4.1.3.13.

4.1.3.1 Power Distribution Tests

Three tests were run to check out the prefiring functioning of the power distribution system. They were:

a. Power distribution system automatic checkout.
b. Stage power setup.
c. Stage power turnoff.

4.1.3.1.1 Power Distribution System (1B55815 NC)

Test Explanation

This checkout procedure provided the automatic and manual test sequences required to verify the functional capability of the forward and aft power distribution system. The procedure verified that static loads on the power buses were not excessive, and the proper operation of the power switching circuits.

Test Review

This test, performed on 12 April 1966 and accepted on 18 April 1966, verified the functional capability of the power distribution system to supply power to the stage.

The static loads on the power buses were not excessive, and the power switching circuits were verified for porper operation.

Sixteen revisions were written against this procedure: Eight revisions corrected dictionary and program errors; four accepted out-of-tolerance voltage measurements as a result of insufficient delay times for computer response; two accepted results where components were not installed; and one revision deleted steps not applicable when simulators were installed.

There were no discrepancies on record.

4.1.3.1.2 Stage Power Setup (1B55813 NC)

Test Explanation

The purpose of this procedure was to verify the operational capability of the automatic checkout system to control and activate the stage electrical power distribution system. The test ensured that excessive static loads were not applied to the forward and aft power distribution system during the initial setup; controlled power switching to and within the stage.

4.1.3.1.2 (Continued)

Test Review

This test, performed on 30 March 1966 and accepted on 6 April 1966, verified the operation of the power distribution system to supply electrical power to the various stage systems under controlled power switching, and that the initial static loads on the forward and aft power distribution systems were not excessive.

Five revisions were written against this procedure: Three revisions pertained to a program error, an operator error, and a normal safety item monitor interrupt resulting from open LOX and LH_2 prevalves due to the lack of stage pneumatics; and two revisions pertained to the aft 5 VDC excitation module frequency and voltage. P/N 1A77310-503, S/N 0067, was removed and replaced with P/N 1A77310-503, S/N 0074, per FARR A179156.

4.1.3.1.3 Stage Power Turnoff (1B55814 NC)

Test Explanation

The purpose of this checkout procedure was to provide the automatic and manual test sequences required to secure (shut down) the stage power distribution system after completion of the various stage system checkouts which utilized power from the power distribution system.

Test Review

This test, performed on 30 March 1966 and accepted on 6 April 1966, verified the operational capability of the stage power turnoff procedure (test sequence) to deactivate the stage power distribution system to a pretest or standby condition.

One revision was written to this procedure pertaining to not resetting the safety item monitor prior to turnoff. The interrupt resulted from open LOX and LH_2 prevalves due to the lack of stage pneumatics.

There were no discrepancies on record.

4.1.3.2 Digital Data Acquisition System Tests

Three tests were run to verify the calibration and prefiring operation of the digital data acquisition system. These tests were:

a. Digital data acquisition system calibration, manual operations.

4.1.3.2 (Continued)

b. Digital data acquisition system calibration.

c. Digital data acquisition system, automatic checkout.

4.1.3.2.1 Digital Data Acquisition System Calibration, Manual Operation (1B44475 A)

Test Explanation

The purpose of this checkout procedure was to provide supplementary manual instructions required to verify the calibration of the pulse control modulated (PCM) data system during automatic checkout. This procedure was utilized in conjunction with H&CO 1B55816, automatic DDAS checkout.

Test Review

This test, performed and accepted between 1 and 6 April 1966, verified the PCM data system operation and calibration. For this test the PCM data system consisted of the multiplexers, the PCM/DDAS assembly, and the 600KC VCO coax linkage to the GSE automatic checkout system.

One revision was written to this procedure pertaining to interchangeable test cables which were identical in design.

There were no failures on record against this test.

4.1.3.2.2 Digital Data Acquisition System Calibration (1B55816 NC)

Test Explanation

The purpose of this checkout procedure was to function the digital data acquisition system under prescribed design parameters, and to monitor the performance of the system components. Included in the functional verification were the Model 270 multiplexers, digital data acquisition assembly, digital data acquisition system ground station, and data channel input impedance.

Test Review

This test, conducted on 1 April 1966 and accepted on 6 April 1966, verified the operational capability and design integrity of the digital data acquisition assembly. Signal levels (0, 1.25, 2.50, 3.75, and 5.00 VDC) were manually applied to the Model 270 multiplexers, and the output transmitted through the system by closed-loop to the ground support equipment digital data acquisition system for monitoring and verification.

4.1.3.2.2 (Continued)

Eleven revisions were written to this procedure: Six corrected program errors or problems; four pertained to the repeat of individual multiplexer tests as a result of a slight variation in the direct current power supply, which generated noise spikes (the repeat tests were within tolerance parameters); and one revision cleared the initial conditions scan malfunctions resulting from missing hardware as not required for digital data acquisition system calibration.

No discrepancies are on record against this procedure.

4.1.3.2.3 Digital Data Acquisition System (1B55817 NC)

Test Explanation

The purpose of this digital data acquisition system test was to provide an operational status verification of all data channels on the stage. The verification included the proper operation of all signal conditioning units and associated amplifiers, command calibration channel decoders, multiplexers, digital data acquisition assembly, and the central command calibration decoder assembly.

Test Review

This test, performed on 6 May 1966 and accepted on 11 May 1966, verified the operation of the stage digital data acquisition system. All channels possessing signal insertion capability were compared individually, to their respective tolerance limits, through the remote automatic checkout system, and the channels without the automatic capability were verified by comparing the end item output at ambient conditions to their respective tolerance limits.

A total of thirty-five revisions were written to this procedure: Twenty-one corrected program errors; six covered channel checks verified as accomplished by other procedures; three revisions pertained to out-of-tolerance measurements subsequently rerun and accepted; three deleted channel checks not required for prefire checkout; and two accepted open channel conditions resulting from disconnected component parts during the test.

There were no discrepancies on record.

4.1.3.3 Level Sensor and Control Unit Calibration (1B44473 NC)

Test Explanation

The purpose of this procedure was to adjust the point level sensor control units to a level well within the limits of capacitance change created by a simulated remote automatic checkout system command. The point level sensor units consisted

4.1.3.3 (Continued)

of the liquid level and liquid gas differentiator sensor systems, the LOX and LH_2 point level systems, the LOX and LH_2 tank overfill, and the LOX and LH_2 fast fill sensor systems.

Test Review (Run 1)

This level sensor and control unit test, initiated on 30 March 1966 and accepted on 7 April 1966, verified that the calibration adjustments for the operating points of the control units (in conjunction with the level sensors) were within the design parameters to determine the liquid levels in the stage tanks with accuracy.

Three revisions were written to this procedure: One revision accepted an out-of-tolerance voltage measurement resulting from a malfunctioning aft 5 VDC excitation module, and two revisions pertained to the rerun of the liquid level and liquid gas differentiator sensor calibration, forward and aft. The above mentioned 5 VDC module was replaced per FARR A179156.

Test Review (Run 2)

This test, performed and accepted between 25 April 1966 and 10 May 1966, was rerun to recalibrate the control units for the fuel tank control point level sensor number one and the fuel tank overfill which were interchanged following the initial calibration.

Three revisions were written against this run: One revision provided instructions for the equipment setup for the recalibration procedure; one pertained to the recalibration requirement following the interchange of the control units, P/N 1A68710-503, for the fuel tank point level sensor number one and the overfill; and one deleted the requirement for calibrating the fuel tank fastfill control unit. (This unit was not available and will not be installed for static firing.)

4.1.3.4 Signal Conditioning Setup (1B44474 NC)

Test Explanation

The purpose of this manual checkout procedure was to calibrate any stage signal conditioning equipment determined to be out-of-tolerance during the running of H&CO 1B55817, or after component replacement.

4.1.3.4 (Continued)

Test Review

This test, initiated on 20 April 1966 and accepted on 22 April 1966, calibrated the stage signal conditioning equipment that was utilized to convert the monitored function signal to an input compatible to the telemetry system. (0 to 5 VDC)

Seven revisions were written against this procedure: Three pertained to the manual channels not checked in H&CO 1B55817, because of transducer shortages or hardwire disconnects; three revisions provided the directions to readjust the low gain DC amplifiers, P/N 1A74053-501, for the single sideband FM transmitter output and volt fuel boreoff bias voltage, and forward and aft 5 VDC excitation modules, P/N 1A77310-503, S/N's 00054 and 00074 respectively; and one revision deleted the operational requirements on the transmitter switch assembly, linear displacement transducers, and telemetry calibrator as accomplished during H&CO 1B55817.

FARR A188084 removed and replaced channel decoder P/N 1A74053-501, S/N 046.

FARR A188145 indicated that a low gain DC amplifier, P/N 1A94910-505, S/N 00231, drifted excessively after twenty-four hours.

4.1.3.5 Compatibility Checks

The two tests designed to verify the prefiring condition of the stage electrical wiring were:

a. APS module interface compatibility check.
b. Umbilical interface compatibility check.

4.1.3.5.1 Interface Compatibility, Auxiliary Propulsion System and Stage (1B49558 NC)

Test Explanation

This checkout procedure specified the continuity/compatibility tests to be performed after the installation of the auxiliary propulsion system (APS) simulators, Model DSV-4B-188C, P/N 1A56772-1, on the stage. The tests to be conducted included:

a. APS engine/stage compatibility check by measuring the resistance between the stage control relay package connections and the APS engine valves. This involved forty-eight separate resistance measurements.

4.1.3.5.1 (Continued)

b. APS control system compatibility check by measuring the resistance between the aft skirt connections and the components inside the APS units. There were twenty-two separate resistance measurements.

NOTE: The auxiliary propulsion system checkout, H&CO 1B55825 NC, was required prior to any electrical hook-up (ref: paragraph 4.1.3.11).

Test Review

This checkout procedure, conducted and accepted between 13 and 26 April 1966, verified the continuity/compatibility relationship at the interface of the stage and the APS modules, through the use of the APS simulators, Model DSV-4B-188C.

One revision was written to this procedure, providing instructions and wiring diagrams for proper connection of the APS simulators to the stage.

There were no discrepancies on record.

4.1.3.5.2 Umbilical Interface Compatibility Check (1B64318 NC)

Test Explanation

This procedure provided the necessary test point-cable designations, umbilical pin of applicable cable assembly plugs, sequence numbers to identify control drawings, functions of each circuit, test point connections of the signal distribution unit number 463, and resistance measurements values and parameters required to verify the integrity of the stage umbilical wiring.

Test Review

This test, conducted and accepted between 26 and 31 March 1966, verified the integrity of the stage umbilical wiring, and assured that proper loads were present for power input without damage to the stage.

Twenty revisions were written to this procedure: Sixteen revisions corrected errors in the program or the procedure, and four accepted resistance measurements accomplished with components not installed.

There were no discrepancies on record.

4.1.3.6 Propellant Utilization System Tests

The checkout procedures conducted to ensure proper operation of the propellant utilization system were:

a. Propellant utilization system calibration.
b. Propellant utilization system automatic checkout.

4.1.3.6.1 Propellant Utilization System Calibration (1B44476 A)

Test Explanation

The purpose of this manual checkout procedure was to verify that the propellant utilization system calibration was within the design parameters established, to ensure the proper depletion ratio for the LOX and LH_2 during powered flight.

Test Review

This calibration procedure, conducted and accepted on 7 April 1966, verified the propellant utilization system by the following sequence of tests:

a. Static inverter-converter output voltage verification.
b. LH_2 and LOX bridge empty and full calibration.
c. LH_2 and LOX bridge position data acquisition.
d. LH_2 and LOX bridge slew checks (1/3 and 2/3 slew).
e. Ratiometer calibration.
f. LH_2 and LOX bridge linearity checks.
g. Hardwire loading circuits verification.

Four revisions were written to this procedure: One revision provided the in-tank temperature, relative humidity, composition, and pressure conditions before and during the calibration operation; the second revision established the requirement to perform the LOX and LH_2 propellant utilization sensor megger checks prior to conducting the environmental checks; the third revision required recalibration of the propellant utilization electronic assembly per revised calibration data; and the fourth revision accepted out-of-tolerance voltage measurements on the inverter-converter assembly.

There were no discrepancies on record.

4.1.3.6.2 Propellant Utilization System Automatic Checkout (1B55823 NC)

Test Explanation

The purpose of this automatic checkout procedure was threefold, verifying the following:

a. System power requirements were satisfied and the operating temperature of the propellant utilization system assemblies were within tolerance.
b. Propellant utilization system checkout from the LOX and LH_2 mass sensor probes to the summing network (including the proper operation of the loading potentiometers, rebalance potentiometers, and the fast fill and overfill sensors).

4.1.3.6.2 (Continued)

c. Propellant utilization system checkout from the shaping network, through the valve positioner, and from the servo bridge through the valve positioner. Included as a part of this test were the wiring checkouts for the LOX and LH_2 mass sensor probes and the propellant utilization system, and the command circuits through the switch selector and sequencer, which were required to accomplish this checkout.

Test Review

This checkout, initiated on 12 April 1966 and accepted on 5 May 1966, verified the automatic mode of operation which the propellant utilization system determined and controlled the engine propellant flow mixture ratio to ensure simultaneous propellant depletion.

Five revisions were written against this procedure: Four revisions corrected program errors, and one pertained to the procedural steps accomplished by other closely related procedures.

There were no discrepancies on record.

4.1.3.7 Telemetry System Tests

Two prefiring tests were conducted to check out the telemetry system. These were:

a. Telemetry system manual checkout.
b. Telemetry system automatic checkout.

4.1.3.7.1 Telemetry System Manual Operations (1B44478 NC)

Test Explanation

This procedure provided the instructions to perform the manual operations required during dynamics testing of the telemetry system in conjunction with automatic H&CO 1B55820.

Test Review

This manual test, utilized to perform portions of the telemetry system evaluation was initiated on 16 April 1966 and accepted on 19 May 1966. It verified the stage sub-carrier oscillator adjustments, channel assignments, sub-carrier oscillator pre-emphasis, transmitter adjustments, flight tape recorder, and program plugs.

Four revisions were written to this procedure: One deleted the portions of this procedure that were not required; one provided instructions to check the frequency

4.1.3.7.1 (Continued)

of pulses for particular channels during channel verification; one revision pertained to repeating the checkout of the airborne tape recorder after replacement; and the last revision accepted the control circuitry checkout for the tape recorder.

4.1.3.7.2 Telemetry System (1B55820 NC)

Test Explanation

The purpose of this automatic test was to provide the test sequences required to function the telemetry systems in the flight mode. The telemetry systems received, measured, and transmitted flight instrumentation data (acceleration, force, motion, pressure, strain, temperature, vibration, and time-event functions) to ground station receivers.

Test Review

This checkout, conducted on 15 April 1966 and accepted on 6 May 1966 verified the PAM/FM/FM system design integrity and operational capability. The telemetry system calibration was automated with the exception of the manual portions which could not be implemented. The following items were verified.

a. Sub-carrier oscillator band adjustment and the associated pre-emphasis schedule.
b. Telemetry calibration performance.
c. Alignment of measurements with the correct telemetry channels and pulse modulation multiplexers.
d. Correct operation of the PAM data train.
e. Antenna systems, including the transmitter power outputs, voltage standing wave ratio of the open and closed loops, and insertion losses.
f. FM/FM transmitter center frequency (three separate units).
g. Flight tape recorder operation and degradation of data (includes the by-pass, fast record, slow record, and playback modes).
h. Program plugs for each sub-carrier oscillator mounting assembly.

Twelve revisions were written to this procedure: Eight revisions corrected program errors; and one each revision provided instructions to supply commands for remote automatic checkout system verification of FM/FM transmitter number two, changed tolerances on ambient measurements to be compatible with actual conditions

4.1.3.7.2 (Continued)

as verified by the digital data acquisition system, increased the delay time between successive remote automatic checkout system commands, and the acceptance of a frequency measurement as being within the specification on natural bending measurement amplifiers.

There were no discrepancies on record.

4.1.3.8 Range Safety System Tests

Three tests were run to check out the range safety system prior to static acceptance firing. The tests were:

a. Range safety receiver, manual checkout.
b. Range safety receiver, automatic checkout.
c. Range safety system, automatic checkout.

4.1.3.8.1 Range Safety Receiver Manual Operations (1B44477 NC)

Test Explanation

The purpose of this manual checkout procedure was to aid in the determination of the flight readiness of the range safety receiver system, and to provide the instructions for test equipment setup and manual operations to be performed in conjunction with the range safety receiver check, H&CO 1B55819.

Test Review

This test, conducted and accepted between 18 April 1966 and 5 May 1966, verified the capability of the range safety receivers to receive ground initiated commands for J-2 engine cutoff, and propellant dispersion, and to secure the range safety system while in flight.

Five revisions were written against this procedure: Two corrected typing errors in the procedure; one provided instructions to turn on the 150 KC switch to set up the 60 KC deviation; and two revisions pertained to instructions to setup and recheck the range safety receiver 2 automatic gain control 2% repeatability. The initial check of range safety receiver 2 indicated repeatability in excess of the 2% tolerance; however, subsequent investigation determined the cause for non-repeatability was in the automatic program, 1B55819, measuring on high level signal strength and not low level signed strength. A rerun of this portion of the test indicated repeatability within the 2% tolerance.

4.1.3.8.2 Range Safety Receiver Checks (1B55819 NC)

Test Explanation

The purpose of this checkout procedure was to check the range safety receivers for automatic gain control calibration and drift, minimum acceptable deviation sensitivity, and minimum acceptable radio frequency sensitivity.

Test Review

This test, performed on 19 April 1966 and accepted on 6 May 1966, verified the design integrity and operational capability of the flight termination system to initiate emergency fuel dispersion on command. Components included in the flight termination system were the antenna system, radio frequency system, command receivers, destruct system controllers, exploding bridgewire firing units and detonator, and a common safe and arm device that connected the system to the explosive harness.

Three revisions were written to this procedure: One accepted the initial conditions scan for malfunctions as pertaining to items not required to accomplish the range safety receiver checks; and two pertained to the range safety receiver 2 automatic gain control repeatability and the subsequent rerun to verify repeatability.

4.1.3.8.3 Range Safety System (1B55821 A)

Test Explanation

The purpose of this checkout procedure was to provide the automatic and manual test sequences to function the range safety system under prescribed design parameters, and to monitor the performance of each item under test. Physically the range safety system consisted of two antennas, a power divider, two voltage regulators, two controllers, two exploding bridgewire firing units, one safe and arm device, and two exploding bridgewire detonators.

Test Review

This test, conducted and accepted between 6 and 10 May 1966, verified the design integrity and operational capability of the range safety system as a means of flight termination and propellant dispersion. The test sequences included:

a. Exploding bridgewire and receiver external/internal power transfer.
b. Engine cutoff.

4.1.3.8.3 (Continued)

c. Pulse sensor and propellant dispersion command inhibit.

d. In-flight turn-off command.

e. Arm and engine cutoff command.

f. Propellant dispersion command.

g. Safe and arm device.

Twelve revisions were written against this procedure: Ten corrected program errors; one provided instructions to install the proper cables to the sequencer, to enable the range safety equipment and facility checkout, and to remove the cables after the range safety test was completed; and one verified the test set setup and operation.

There were no discrepancies on record.

4.1.3.9 Telemetry and Range Safety Antenna System Check (1B44472 NC)

Test Explanation

The purpose of this checkout procedure was to provide the sequence of tests to verify the operational integrity of the telemetry and range safety antenna (RF) systems. The test sequence included:

a. System insertion loss measurements for the cable networks of the various channels, utilizing the respective input frequencies.

b. Voltage standing wave ratio (VSWR) measurements of the antenna transmissions lines.

c. Range safety RF system checks (continuity, insulation resistance, and directivity).

d. Telemetry RF power detector calibrations (orbit, flight, and SSB transmitter power detectors, and antenna forward and reflected power measurement calibrations).

e. Transmission line phasing.

Test Review

This test, performed and accepted between 5 and 18 April 1966, verified the telemetry RF power detector calibrations for the orbital, flight, and single sideband transmitters; and the antenna forward and reflected power measurements for antenna systems 1, 2, 3, and 4.

Two revisions were written to this procedure. The first revision deleted the requirements to perform the systems insertion loss measurements, VSWR measurements, range safety RF system checks, and the transmission line phasing, as

4.1.3.9 (Continued)

these tests were performed and accepted per the T/M and RS antenna system H&CO 1B44545 at SSC; and the second revision corrected the data documentation sheets to eliminate transmitter data no longer required.

Five FARR's were written during this procedure. FARR's A188032, A188040, A188043, and A188044 dealt with power converters, P/N 1A74776-503, S/N's 2-0217, 2-0182, 2-0140 respectively. All power detector problems involved output voltages which could not be adjusted to H&CO requirements. The detectors were retested and accepted after rework. FARR A188083 noted a low coupling coefficient for reflected power from coupler, P/N 1A69214-503, S/N 0011. The coupler was replaced.

4.1.3.10 Single Sideband System Tests

There were two tests run to verify the functional capability of the single sideband system. These were:

a. Single sideband system manual setup.
b. Single sideband system, automatic checkout.

4.1.3.10.1 Single Sideband System Manual Operations (1B58685 NC)

Test Explanation

This checkout procedure provided the manual test sequences required to function the single sideband/FM system as a prerequisite to accomplish H&CO 1B55818; and provided detailed coverage for energizing the necessary test equipment to establish the ground support status. The airborne equipment under test consisted of transducers, signal conditioners, multiplexer, single sideband translator, composite signal amplifiers, FM transmitter and associated amplifier, and RF switching equipment.

Test Review

This test, initiated on 21 April 1966 and accepted on 14 May 1966, verified the design integrity and operational capability of the single sideband airborne equipment, to detect and process the vibrational and acoustical data. The processed data, in the form of a multiplexed, fixed amplitude signal, contained fifteen channels of data from 50 to 3000 cycles at the amplitude level representative of the G-force at which the frequency originally occurred. The tests conducted included:

4.1.3.10.1 (Continued)

a. Pilot tone frequency and amplitude test.
b. Channel amplitude and alignment.
c. Marker channel test.
d. Pre-flight sweep calibration test.
e. Single sideband/FM channelization test.
f. In flight calibration.
g. Single sideband/FM transmitter deviation and information test.

Twenty revisions were written against this procedure: Nine corrected program errors and omissions; five accepted out-of-tolerance roll-off characteristics between 50 and 3000 cps that were not attributed to the airborne equipment; three revisions provided instructions for the setup and manual checkout of the stage single sideband/FM system; and three revisions covered an open channel for which there was no data requirement, a channel designated as not required for static firing data, and the deletion of steps previously accomplished.

There were no discrepancies on record.

4.1.3.10.2 Single Sideband System (1B55818 NC)

Test Explanation

The purpose of this checkout procedure was to provide the test sequences to function the single sideband system under prescribed parameters, and to monitor the performance of each item under test. The test sequences included:

a. Power distribution.
b. Sequencer commands.
c. Remote automatic calibration assembly.
d. Marker channel verification.
e. Pre-flight sweep calibration.
f. SS/FM channel verification.
g. SS/FM transmitter check.

Test Review

This checkout procedure, conducted and accepted between 5 and 10 May 1966, verified the design integrity and operational capability of the single sideband system. Each channel of single sideband transmitter was checked from the originating transducer and signal conditioning unit, through the multiplexer unit, the translator unit, and finally at the output of the single sideband transmitter. This

4.1.3.10.2 (Continued)

included the stage interface connection, and the proper patching of each response routed through a specific response (signal) conditioner channel.

Two revisions were written to this procedure to correct program errors.

There were no discrepancies on record.

4.1.3.11 Cryogenic Temperature Sensor Verification (1B44471 NC)

Test Explanation

The purpose of this manual checkout procedure was to test each cryogenic temperature transducer for which the normal operating range did not include room ambient temperature. The transducers covered by this procedure consisted basically of platinum resistance elements that changed resistance values according to the Callendar-Van Dusen equation. These were used to measure sub-ambient temperatures while exposed to air, liquid and gaseous helium, liquid hydrogen, and liquid oxygen.

Test Review

This test, conducted and accepted between 23 and 30 March 1966, verified the operation of each cryogenic temperature transducer, by recording the observed resistance measurement at ambient temperature and comparing the value to the appropriate parameter calibration curve.

One revision was written to this procedure that accepted out-of-tolerance resistance measurements for transducers within the LH_2 tank which occurred because of the tank temperature variations.

There were no discrepancies on record.

4.1.3.12 Exploding Bridgewire System (1B55822 NC)

Test Explanation

This procedure defined the manual setup and the automatic tasks required to verify the capability of the exploding bridgewire system to initiate ullage rocket ignition and jettison when so commanded in flight by the instrumentation unit.

Test Review

This test, performed on 15 April 1966 and accepted on 19 April 1966, verified the capability of the exploding bridgewire system to initiate the ordnance functions

4.1.3.12 (Continued)

of ullage rocket ignition and ullage rocket jettison. The general test sequence included:

a. Preliminary exploding bridgewire firing unit and pulse sensor test.
b. Exploding bridgewire firing unit ignition pulse sensor self test.
c. Ullage rocket exploding bridgewire firing unit test.
d. Ullage rocket jettison firing unit test.

Four revisions were written to this procedure: Two corrected program errors; one inserted breakpoints in the procedure to permit sufficient time to reset the pulse sensors and the pulse sensor power; and one revision cleared the initial scan condition malfunctions as the functions questioned were not utilized during this checkout procedure.

No failures were noted during this test.

4.1.3.13 Auxiliary Propulsion System (1B55825 NC)

Test Explanation

This checkout procedure provided the sequence of tests required to verify the design integrity and operational capability of the auxiliary propulsion system (APS) electrical system. Specific tests, utilizing the APS simulator, model DSV-4B-188C, P/N 1B56722-1, in lieu of the flight modules, verified:

a. That bus power application and static loads not excessive.
b. That attitude control commands from the instrument unit (IU) controlled the proper sets of quad-redundant solenoids.
c. Telemetry system measurements, APS associated, through observation of each active stage parameter and each simulated transducer output.

Test Review

This automatic checkout procedure, initiated on 15 April 1966 and accepted on 2 May 1966, verified that a suitable electrical interface existed between the stage and the APS modules as depicted by the test results utilizing the APS simulators.

Ten revisions were written to this procedure.

a. Four revisions accepted out-of-tolerance current measurements as the program values did not allow for the line drop between the stage and the simulated loads.

4.1.3.13 (Continued)

b. Two revisions corrected initial condition scan errors.

c. Two revisions corrected program errors.

d. One revision provided instructions to verify the engine command ullage circuitry operation.

e. One revision deleted the requirement for the digital events recorder tape verification. (The DER was not channel verified as of 15 April 1966 and the tape not available during this test.)

There were no discrepancies on record against this procedure.

4.1.4 Inspection, Structural (1B40653 NC)

Test Explanation

The purpose of this test procedure was to verify that transportation and handling had no detrimental effect on the stage structure, and to establish the stage pre-fire condition for comparison to the post-fire condition.

Test Review

This test, initiated on 31 March 1966 and accepted on 29 April 1966, verified the pre-fire structural integrity of the stage. Receiving inspection of the electrical, propulsion, and structural components was performed per QEC 339, and the externally bonded supports on the stage tanks inspected per QEC 328, 330, 340, and 341. Alignment of the auxiliary propulsion system (APS) support structure, P/N 1B39246, was checked by the installation of an APS module at positions I and III on the stage.

The revisions to this procedure included:

a. Deletion of the LOX and LH_2 tank internal inspection requirements, unless work to be accomplished necessitated entry into either tank.

b. Deleted the installation of the thrust structure door as it was accomplished on another handling and checkout procedure.

c. Performed a radiographic inspection of the forward crotch area, aft skirt, to determine existence of foreign material.

FARR A188130, concerning the above foreign material, noted that the condition was acceptable to Engineering for use.

4.1.5 Common Bulkhead, Vacuum System (1B49286 D)

Test Explanation

The purpose of this checkout procedure was to provide instructions for setting

4.1.5 (Continued)

up and testing the common bulkhead vacuum system prior to static acceptance firing. The sequence of operations included the test stand (Beta 1) vacuum system setup and checkout, and the common bulkhead 96-hour pumpdown, decay check, argon purge, and the leak check with the LOX and LH_2 tanks pressurized.

Test Review

This checkout procedure, initiated on 29 March 1966 and accepted on 5 May 1966, verified the design integrity of the common bulkhead assembly.

Three revisions were written against this procedure: One revision corrected a typographical error, one deleted a step not necessary for this checkout, and one revision re-initiated the checkout procedure after reconnecting lines which had been capped per the procedure.

There were no discrepancies on record.

4.1.6 Thermo-Conditioning and Environmental System Tests

Three checkout procedures were run to verify the operation of the forward skirt thermo-conditioning system, prior to static firing. The tests were:

a. Forward skirt thermo-conditioning system, checkout and operating procedure.
b. Aft skirt and interstage purge.
c. Forward and aft skirt purge and checkout.

4.1.6.1 Checkout and Operating Procedure, Thermo-Conditioning System, Forward Skirt (1B41955 NC)

Test Explanation

This checkout procedure provided the handling and equipment setup instructions to connect the thermo-conditioning system servicer, P/N 1A78829-1, to the forward skirt thermo-conditioning system (TCS); and instructions to perform a TCS leak check, remote operation test, water/methanol cleanliness and specific gravity checks, and a TCS differential pressure test.

Test Review

This test, initiated on 26 March 1966 and accepted on 2 May 1966, verified that the TCS provided a thermally conditioned heat transfer fluid (water/methanol), as required, to the electrical/electronic equipment mounting panels, through the appropriate machined passages in the panel face plates.

4.1.6.1 (Continued)

The revisions to this procedure included: Replacement of the hose assemblies, P/N's 1B38536-1, and -501, with tube assemblies, P/N's 1B70615-1 and 1B70616-1; replacement of the gaseous nitrogen hose assembly, P/N 1B37783-1, with hose assembly, P/N 1A77023-501; and instructions to repair the filter assemblies, P/N 1B26965-1, per maintenance procedure 1B37949 "G".

Although no FARR was generated, some difficulty was encountered with the water/methanol cleanliness test. Five fluid samples were tested and the results were unsatisfactory (ref: laboratory report LR660645, dater 3-26-66). The filter assemblies P/N 1B26965-1, S/N's 039 and 001, were removed to inspect the filter elements, P/N MCS 1001 USAS.

The Engineering comments indicated the filter elements were not sufficiently contaminated to increase the internal pressure beyond the yield point of the differential pressure buttons, and the elements were not securely mounted, permitting fluid by-pass and a minimum filtering effort. Replacement of the filter elements and proper installation within the filter assemblies rectified the contaminated condition.

4.1.6.2 Aft Skirt and Interstage Thermo-Conditioning and Purge System (1B40569 NC)

Test Explanation

The purpose of this test was to perform an operational checkout of the open areas through the main manifold, the position I auxiliary propulsion system simulation module, and the thrust structure ventilation ducting, to determine the aft skirt and interstage thermo-conditioning system airflow characteristics with respect to the operational pressure.

Test Review

This test, performed and accepted between 13 and 30 April 1966, verified the capability of the environmental control system to provide ambient or temperature controlled air through the aft skirt thermo-conditioning system, and a gaseous nitrogen purge within the aft skirt and interstage to prevent formation of explosive mixtures of LOX and LH_2.

Two revisions were written to this procedure: One added the APS simulator, 1B70970-1, for use on the stage; and another provided instructions to install the APS simulator in Position I in lieu of Position III.

4.1.6.3 Environmental Control System, Forward and Aft Skirt Purge (1B43749 NC)

Test Explanation

The purpose of this procedure was to verify the operational capability of the environmental control system, P/N 1A77551-1, to transport conditioned nitrogen and/or air to the forward and aft skirt areas in such a manner that acceptable levels (percentages) of oxygen were maintained during the purge operation.

Test Review

This test, conducted and accepted on 30 April 1966, verified the operation of the environmental control system during the purging operations. The tests included:

a. Forward skirt purge system visual inspection to ensure proper connection of all electrical cables and hoses; pressure check to ensure delivery of the prescribed flow of gaseous nitrogen; heater performance and controller operation; and a pressure check of the secondary gaseous nitrogen system.

b. Aft skirt purge system visual inspection of all electrical cables, hoses, manual dampers, and duct covers; blower operation for prescribed air flow; leak check to ensure a prescribed flow rate of air or gaseous nitrogen; and the heater performance and controller operation.

There were no revisions or discrepancies written against this procedure.

4.1.7 Hydraulic System Tests

The hydraulic system checkout consisted of the following two procedures:

a. Hydraulic system setup and operation.

b. Hydraulic system automatic checkout.

4.1.7.1 Setup and Operation, Hydraulic System (1B41005 NC)

Test Explanation

This procedure provided the instructions necessary to prepare the stage hydraulic system for initial operation, and to maintain the system readiness throughout the pre-fire checkout period.

Test Review

This test, initiated on 14 April 1966 and accepted on 19 May 1966, verified the pre-fire operational setup of the hydraulic system installation, P/N 1A39589. The hydraulic system consisted of two pumps (one driven by an electric motor and the other driven by the J-2 engine oxidizer pump turbine), pitch and yaw

4.1.7.1 (Continued)

actuators, and an accumulator/reservoir assembly, including the system relief valves. The purpose of the hydraulic system which was to position the J-2 engine during flight, in response to electrical steering commands, was verified to the extent of ground testing capabilities.

The operational checkout procedures included:

a. Verification that all hydraulic system components were securely installed and all connections properly torqued.
b. Actuator center check.
c. Engine deflection clearance check.
d. System refill instructions.
e. Instrumentation support verified stage hydraulic system data (pressures, positions, and levels) transmission to the test control center hardware.
f. Shutdown activities.
g. Air bottle decay check.
h. Instrumentation setup for the automatic checkout procedure.
i. Simulated static firing support.

Eleven revisions were written to this procedure: Three pertained to disconnecting hardware cables from stage transducers to trouble-shoot the transducers for reservoir oil level and pressure, and system pressure; three pertained to the verification of engine side loads after restrainer adjustment, and actuator position values; three revisions provided instructions to recharge the accumulator/reservoir with gaseous nitrogen, to record gauge pressure on the stage air bottle, and to manually move the J-2 through a square gimbal pattern prior to performing H&CO 1B55831; one revision deleted a serialization requirement as not required; and one revision provided instructions to remove transducer, P/N 1B31356-503, S/N 208-1, and install P/N 1B31356-503, S/N 245-2. (S/N 208-1 was reading approximately 250 psi below actual).

4.1.7.2 Hydraulic System Automatic Checkout (1B55824 NC)

Test Explanation

The purpose of this test was to provide the automatic and manual test sequences required to verify the integrity of the hydraulic system, and to ensure system

4.1.7.2 (Continued)

operation within specifications. The tests conducted included:

a. Ambient temperature checks.
b. Accumulator precharge test.
c. Reservoir oil level and pressure check.
d. Mid-stroke lock measurements of the actuator piston position potentiometer voltages.
e. Coast mode thermal switch check.
f. System supply and accumulator gaseous nitrogen pressure checks.
g. Reservoir oil level and pressure check.
h. Polarity and linearity checks.
i. Servo actuator frequency response test.
j. Engine centering check.

Test Review

This automatic hydraulic system checkout, commenced on 23 April 1966 and accepted on 5 May 1966, verified the design integrity and operational capability of the stage hydraulic system within specification parameters.

Eight revisions were written to this procedure to correct the program errors introduced during automatic checkout.

There were no discrepancies on record.

4.1.8 Integrated Systems (1B55831 NC)

Test Explanation

The purpose of this checkout procedure was to verify the functional readiness of the stage and automatic cryogenic/pneumatic ground support equipment control systems (utilized during propellant loading and acceptance firing) to proceed with normal countdown operations and activities.

Test Review

This checkout, performed on 9 May 1966 and accepted on 14 May 1966, verified the design integrity and operational capability of the stage and facility systems to

4.1.8 (Continued)

function properly for propellant loading and static acceptance firing. All umbilical, switch selector, and pneumatic/loading ground support functions were exercised and the specific tests accomplished included:

a. Matrix relay reset and power turn-on.
b. Radio frequency systems checks and turn-on.
c. Measurement group function checks, remote automatic checkout systems function checks, and digital data acquisition system channel tests.
d. Power transfer and electrical systems functional checks.
e. Environmental control system functional checks.
f. Hydraulic turn-on, link drop (manual), and gimbal test.
g. Pneumatic console setup and checkout.
h. Propellant loading valve sleds, water sled, deflector water, aspirator, and gaseous hydrogen torch checks.
i. Stage valve functional checks.
j. J-2 engine final sequence checks.
k. Re-establishment of stage tanks and spheres blanket pressures.

A total of thirty-one revisions were written against this procedure: Twenty-one corrected errors in the dictionary, program, and operation; three inserted programmed holds to perform system checks and necessary corrections; three revisions increased time delay factors to ensure receipt of complete data response; and the remaining four revisions covered the deletion of procedural steps not accomplished as a result of component removal, acceptance of a safety item monitor interrupt as a result of program planning, acceptance of an out-of-tolerance pressure transducer measurement as not detrimental to the checkout, and the performance of a helium purge on the gaseous hydrogen system to insure the proper supply of hydrogen for torch ignition.

The discrepancies against the subsystems included:

FARR Number	Part Number	Discrepancy
A191911	1A88599-503	Bad accelerometer E93
A191912	1A68707-525	Bad accelerometer E119

P/N 1A88599-503, was returned to the vendor for rework, and P/N 1A68707-525 was reworked, recalibrated, and replaced.

4.1.9 Static Acceptance Firing Countdown Procedures

This paragraph covers the static acceptance firing simulated countdown exercise,

4.1.9 (Continued)

and the static acceptance firing countdown procedure which was conducted to achieve an acceptable static firing. Also included are reviews of the critical tasks accomplished as a part of the countdown procedure.

4.1.9.1 Countdown, Static Acceptance Firing, Simulated Exercise (1B60567 NC)

Test Explanation

The purpose of the simulated countdown exercise was to demonstrate the overall readiness of the stage systems, ground support equipment (GSE), and facility equipment to proceed with the acceptance firing test program.

Test Review (Simulated Exercise)

This exercise, initiated on 16 May 1966 and completed on 17 May 1966, demonstrated the capability of the combined systems (stage, GSE, and facilities) to function in a state of readiness preparatory to propellant loading and acceptance firing.

After the countdown exercise was run, a cold flow test was conducted to check the system for discrepancies. Leakage was noted in the thrust chamber quick disconnect, P/N 1A9958-533, S/N 019. The disconnect was removed and replaced prior to static firing.

4.1.9.2 Countdown, Static Acceptance Firing Run 1 (1B60567 NC)

Test Explanation

This countdown manual controlled and specified the activities and tasks required to conduct the static acceptance firing for the stage. The firing sequence was established to conform as closely as practical, within the STC capabilities and test objectives, to the launch and flight sequencing. The following major events were contained:

a. Automatic loading of LOX and LH_2 propellants. (LH_2 will be off loaded to 95.5% prior to simulated liftoff)
b. Critical components cycling test.
c. Controlling the LOX tank ullage pressure prior to the first burn, to assure acceptable augmented spark ignition (ASI) reusable probe conditions.
d. Initiating a normal engine start sequence for the J-2 engine first burn.
e. Operating the propellant utilization system closed loop with the fuel boiloff bias active.

4.1.9.2 (Continued)

f. Accomplishing an APS roll engine program utilizing an APS simulator and a spare APS module.

g. Initiating an automatic cutoff at 153 seconds after first burn start command.

h. Accomplishing a simulated orbit coast period.

i. Activating the APS ullage engine immediately after first burn cutoff.

j. Accomplishing an APS pitch and yaw program following first burn cutoff.

k. Initiating J-2 engine conditioning for restart.

l. Operating the PU system in a closed loop mode.

m. Dropping the J-2 engine restrainer links and initiating an engine gimballing program.

n. Automatically initiating second burn cutoff after approximately 300 seconds. (1880 pounds LOX or 490 pounds LH_2, 3% level)

o. Conducting an APS pitch and yaw program following cutoff.

The test objectives were categorized as research and development, and acceptance firing. The research and development objectives included:

a. Determination of stage thermodynamics during the firing program.

b. Determination of vibration and acoustic environment during the firing program.

The acceptance firing objectives included:

a. Countdown control and operational capability.

b. J-2 engine system performance.

c. Oxidizer and fuel systems performance.

d. Pneumatic control system performance.

e. Propellant utilization system performance.

f. Stage data acquisition system performance.

g. Stage electrical control and power system performance.

h. Hydraulic system and J-2 engine gimbal control.

i. Structural integrity.

j. Auxiliary propulsion system/stage interface compatibility.

Test Review (Runs 1A and 1B)

This countdown (number 614061) run 1A was performed on 19 and 20 May 1966, and achieved approximately 50 seconds of mainstage operation before a safety item monitor interrupt signalled for engine cutoff as a result of an excessive LOX tank cold helium inlet temperature. Stage securing was normal in preparation for

4.1.9.2 (Continued)

recycling and subsequent reruns.

Run 1B was initiated on 20 May after test stand inspection; however, this attempt was aborted as the result of external leakage between the body and seat of the cold helium crossover valve in console B which could not be readily corrected.

4.1.9.2.1 Integrated Systems Test, Countdown - Task 35 Run 1 (1B55831 NC)

Test Explanation

The purpose of this checkout procedure, as Task 35 of the Countdown Manual, was to verify design integrity and operational capability of the stage and facility systems to function properly during propellant loading and acceptance firing.

Test Review (Run 1A)

This test, conducted and accepted on 20 May 1966, verified the functional readiness condition of the stage and facility systems to proceed into the propellant loading phase of operation and into the subsequent phases. The critical stage systems were verified during the final preloading phase of the countdown.

A total of thirty-eight revisions were written against this procedure: Eighteen corrected dictionary and program errors; eight covered the addition of procedural steps to effect a more complete checkout; three revisions deleted procedural steps no longer required for this checkout; and the remaining nine revisions covered: Verification that the stage receivers were tuned properly; an increase in the aft bus 2 voltage measurement to compensate for an overcharged primary battery; energizing the auxiliary hydraulic pump to produce an additional load on the aft bus 2 to assist in depleting the overcharged primary battery; repeating a test segment to re-verify the results obtained on the side load recorder; repeating the SSB portion of a test segment to re-verify the SSB data; accepting a safety item monitor interrupt resulting from the loss of prevalve indications when the stage power was removed; acceptance of out-of-tolerance pressure checks as a result of prepressurized transducers at test time; and instructions to verify the individual gaseous hydrogen talkback functions to ensure a redundant network to prevent a firing program interrupt in the event of a talkback malfunction.

4.1.9.2.2 Automatic Propellant Loading - Tasks 41 and 42 Run 1 (1B55834 NC)

Test Explanation

This procedure provided the manual and automatic test sequences required to verify the safe transfer of propellants and gases to the stage during countdown activities. This procedure was conducted as Tasks 41 and 42 of the Countdown Manual.

Test Review (Run 1A)

This procedure, conducted and accepted on 20 May 1966, verified the safe transfer of propellants (LH_2 and LOX) and gaseous helium to the flight stage in preparation for the static acceptance firing. Included in the test sequences were:

a. LH_2 tank pretest purge.
b. LOX loading.
c. LH_2 loading, cold helium bottle fill, and ambient helium bottle fill.
d. LOX and LH_2 tanks overfill sensor checks, and the flow check of all cold gas circuits.
e. LOX and LH_2 umbilical purges.

There were no revisions and/or discrepancies on record against this checkout procedure.

4.1.9.2.3 Acceptance Firing - Tasks 44 and 45 Run 1 (1B55835 NC)

Test Explanation

This procedure defined the sequence of tests required to verify the propulsion and stage systems performance during the hot firing environment generated by the J-2 engine under full thrust conditions. This procedure was conducted as Tasks 44 and 45 of the Countdown Manual.

Test Review (Run 1A)

Run 1A, conducted on 20 May 1966, verified the capability of the propulsion and stage systems to initiate static firing, and to attain approximately 50 seconds of main stage operation before cutoff. This test was terminated by a safety item monitor interrupt, because the LOX tank helium inlet temperature was in excess of design parameters.

Test Review (Run 1B)

Run 1B, conducted on 20 May 1966, was terminated prior to the engine start command as a result of malfunction indications from the engine control helium bottle

4.1.9.2.3 (Continued)

fill. Subsequent investigation determined the Automatic Stage Servicing and Checkout Pneumatic Console B, Model DSV-4B-320, P/N 1A98161-1, developed a leak in the cold helium portion. The cold helium environment produced sub-normal operating conditions for the console; hence the test was terminated.

Three revisions were written to this procedure: One corrected a program error associated with the cutoff routine; one covered the removal and replacement of an ignition detection probe that exhibited intermittent operation; and one revision accepted a no talkback condition at the LH_2 100% level because of an amplifier was not installed.

4.1.9.3 Countdown, Static Acceptance Firing (1B60567) Run 2

Reference paragraph 4.1.9.2.

Test Review (Run 2A)

This countdown (number 614063) run 2A, conducted on 25 and 26 May 1966, achieved the full duration two burn acceptance firing with no major difficulties encountered. The first burn acceptance firing was cut off at 150 seconds per the preprogrammed sequence of events; the simulated orbit lasted 1.5 hours; and after an automatic restart, the second burn acceptance firing attained 300 seconds burn time before a normal engine cutoff terminated the firing. The stage securing was conducted normally with detanking of the residual propellants and tank purging.

4.1.9.3.1 Integrated Systems Test, Countdown - Task 35 Run 2 (1B55831)

Test Explanation

Reference paragraph 4.1.9.2.1.

Test Review (Run 2A)

This run, performed and accepted on 26 May 1966, verified the design integrity and functional capability of the stage and facility systems to proceed with countdown operations for propellant loading and acceptance firing.

Thirty-eight revisions were written against this procedure: Fourteen covered the correction of errors in the program and/or dictionary, and a loose wiring problem area; thirteen added procedural steps to cover halts and hold points not programmed, and provided instructions to ensure redundant capabilities for firing; seven revisions pertained to program and tolerance changed designed to attain

4.1.9.3.1 (Continued)

maximum test results and realistic program values; and four revisions deleted procedural steps and activities no longer required for program checkout.

The LH_2 repressurization control valve failed to close; hence, solenoid valve L-2, P/N 1B43660-507, was replaced and the leak check reverified.

4.1.9.3.2 Automatic Propellant Loading - Tasks 41 and 42 Run 2 (1B55834)

Test Explanation

Reference paragraph 4.1.9.2.2.

Test Review (Run 2A)

This run, performed and accepted on 26 May 1966, verified the capability of the facility and ground support equipment to safely transfer LOX and LH_2 to the flight stage during the normal countdown sequences.

Five revisions were written to this procedure to correct errors in the program and/or dictionary.

4.1.9.3.3 Acceptance Firing - Tasks 44 and 45 (1B55835) Run 2

Test Explanation

Reference paragraph 4.1.9.2.3.

Test Review (Run 2A)

This run, conducted and accepted on 26 May 1966, verified the propulsion and integrated systems capabilities to function in a hot firing environment generated by the J-2 engine. This static firing demonstrated the automatic restart capability of the J-2 engine per the following sequence: Initial mainstage ignition with a burn time of 153 seconds before termination by a programmed cutoff; simulated coast period to check the LH_2 continuous vent system; and the automatic J-2 engine restart for an additional 300 seconds of mainstage burn time with a normal cutoff by the LOX depletion sensors at the programmed percentage value.

Thirteen revisions were written to this procedure: Seven corrected errors in the program or test request document; four deleted steps or portions of steps from the automatic mode, as either accomplished manually performed by other operations, or not required; and two revisions pertained to increasing delay times to attain the proper engine chill prior to firing.

There were no discrepancies on record.

4.1.10 Test Preparation, Postfiring (1B70766 NC)

Test Explanation

This procedure provided the operational sequences required for the removal of the stage propulsion system test installations utilized for checkout in the VCL. Included in the operations were:

a. Vehicle ground lines removal.
b. Vehicle monitor panel lines removal.
c. Auxiliary pressurization systems removal.
d. Repressurization system reconnection.

Test Review

This procedure commenced on 14 June and was accepted on 2 August 1966. Eight revisions were noted on the revision documentation log sheet, as follows:

a. One provided instructions for relocating the LOX tank ullage monitor point.

b. Two deleted portions of the test because of parts shortages which were not detrimental to the program.

c. One revision installed a blank flange at the LH_2 low pressure duct, as the hardwire transducer normally installed at this location was removed for use elsewhere.

d. One revision provided instructions for reconnecting the inlet lines to the LOX and LH_2 repress control modules, to monitor system status preparatory to the all systems test, H&CO 1B55833.

e. One pertained to capping the monitor lines utilized for the static acceptance firing only.

f. One provided instructions for connecting desiccants to the LOX tank auxiliary pressurization system.

g. One restored the vehicle purge system as completed upon reinstallation of the purge valves.

FARR A192200, written because of an interference fit between the vehicle and the ground support adapter, was the only discrepancy noted against this procedure.

4.1.11 Propulsion System Tests, Postfiring

Eight procedures were conducted to verify the integrity and function of the propulsion system components and associated hardware. The procedures were:

a. Manual controls check.
b. Leak check - test stand.
c. Leak check - VCL.
d. Propulsion system, automatic checkout.
e. Engine alignment verification.
f. Removal procedure - test fittings.
g. APS leak and functional check.
h. APS automatic checkout.

4.1.11.1 Manual Controls Check, (1B70767 NC)

Test Explanation

This procedure provided the test sequences to cycle and verify the stage propulsion manually controlled components, as well as to certify the moisture content of the stage pneumatic control and pressurization sphere.

Test Review

This test was initiated on 8 June and accepted on 16 June 1066. There were no revisions and/or discrepancies on record.

4.1.11.2 Final Propulsion Leak Checks (1B70407 NC)

Test Explanation

This leak check procedure was included as a postfire checkout to verify the integrity of the stage pneumatic system, cold helium system, and the LOX and LH_2 tanks, while in the test stand.

Test Review

This test was initiated on 27 May and accepted on 31 May 1966.

Two revisions were written against this procedure: one deleted the leak and functional checks accomplished by other leak check procedures, H&CO's 1B70413 and 1B70769; and the second revision provided instructions to perform the

4.1.11.2 (Continued)

lockup check on the pneumatic system to ensure that no large quantity leaks existed.

Nine entries were noted on the leak check log sheet, which were corrected either by replacing the seals or retorquing loose connections.

There were no discrepancies on record.

4.1.11.3 Leak and Functional Check, Propulsion System (1B70769 NC)

Test Explanation

This procedure provided the steps necessary to perform the following postfiring checks in the VCL:

a. Pressure switch checks.
b. Low pressure ducts vacuum readings.
c. Pneumatic system leak and functional checks.
d. Turbopump torque checks.
e. Engine start bottle leak check.
f. Engine check valve reverse flow check.
g. Engine gas generator and exhaust system leak check.
h. Engine pump purge leak and functional checks.
i. Engine thrust chamber leak check.
j. Engine pneumatic leak and functional checks.
k. LOX and LH_2 tank pressurization systems leak and functional checks.
l. LOX and LH_2 tanks leak and functional checks.
m. LOX and LH_2 vent systems leak checks.

Test Review

The test was initiated on 15 June and accepted on 29 July 1966. Thirty-six revisions were written to this procedure, as follows:

a. Twelve revisions provided instructions to reconnect the LOX and LH_2 repressurization subsystems as required to perform the all systems test, H&CO 1B55833.
b. Instructions to perform the pressure decoy check on the cold helium spheres.
c. Instructions to temporarily install a hard line in place of a regulator under repair.
d. Instructions to determine the individual readouts for the mainstage pressure switches.
e. Instructions to determine the seat leakage of the LH_2 chilldown check valve.

4.1.11.3 (Continued)

Test Review

f. Setup instructions required for the decay check of the repressurization system.
g. Setup instructions to determine the backflow on the LOX repressurization check valve.
h. Setup instructions to purge the LOX vent and relief system for rework.
i. Setup instructions required to purge the LOX and LH_2 tanks for the structural/mechanical faying leak check.
j. Instructions to remove and replace a leaky flex hose.
k. Instructions to disconnect the "open" control line from the oxidizer turbine bypass valve to prevent inadvertent opening of the valve.
l. Increase the settling-out time to acquire a valid start bottle decay check.
m. Repeat the start bottle decay check subsequent to replacement of the vent and relief valve.
n. Instructions to temporarily install flexible lines at the inlet and outlet connections of the ambient helium module until the hardlines are fabricated.
c. Instructions to disconnect the LH_2 translunar vent termination pressure switch as not required.
p. Instructions to add freon to the LOX tank for completion of the tank leak checks.
q. Instructions to perform leak checks on the augmented spark ignitor line subsequent to re-installation.
r. Instructions to perform the LOX and LH_2 vent and relief valves leak checks.
s. Instructions to determine the minimum/maximum LOX and LH_2 ullage pressures leak rates.
t. Instructions to perform a leak check on the LOX fill and drain valve.
u. Instructions to perform the leak and functional checks of all stage actuation control modules subsequent to re-installation.
v. Delete the procedural steps not required for this test.

4.1.11.4 Propulsion System Test (1B62753 NC)

Test Explanation

The purpose of this procedure was to verify that the propulsion system was capable of functioning in accordance with design requirements subsequent to the two-burn acceptance static firing program. Items tested included:

a. Pressure switches.
b. Pneumatic control system.
c. LOX tank pressurization system.
d. LH_2 tank pressurization system.
e. J-2 engine system.

The components of the respective systems were operated individually for the functional capability verification and to permit fault isolation.

4.1.11.4 (Continued)

Test Review

This procedure was initiated on 31 May 1966 and accepted on 7 June 1966. Forty-eight revisions were written to the procedure: forty-two corrected errors in the program, dictionary, test request document, manual setup, or operation; five changed time or pressure valves to ensure measurement of the correct response values, utilizing a special orfice setup; and one revision accepted the LOX chilldown pump purge pressure switch deadboard minimum pressure (in excess of the 0.50 psi min.), as a result of the accuracy limits of the pickup transducer, slow response time for the telementry talkback, and the small volume module, between the orfice and shutoff valve.

There were no discrepancies on record.

4.1.11.5 Engine Alignment Verification (1B41009 NC)

Test Explanation

This manual procedure provided the requirements and operations for the determination of the J-2 engine alignment, relative to the stage, subsequent to static acceptance firing.

Test Review

Performed and accepted on 1 and 2 June 1966, this alignment procedure verified that the static acceptance firing activity, including the J-2 engine gimbal program, was not detrimental to the engine/stage alignment; and no significant change was noted between the prefire and postfire alignment measurements.

4.1.11.5 (Continued)

Test Review

The operations included in this procedure were:

a. Stage position verification.
b. Engine position verification.
c. Engine thrust chamber exitdiameter.

One revision was written to this procedure deleting portions of the program that were not applicable for this test.

4.1.11.6 Removal Procedure, Propulsion Systems Test Fittings (1B70425 NC)

Test Explanation

This procedure provided the instructions required to accomplish the specific tasks required for removal of the stage propulsion systems test installations preparatory to postfire securing and stage removal from the test stand.

Test Review

This removal procedure was initiated on 27 May and accepted on 6 June 1966. The postfire securing operations included:

a. Disconnecting the helium purge lines and capping the open ports.
b. Disconnecting the GN2 flex hoses and water flex hoses from the diffuse assembly and the tee-ring stiffner from the bell housing of the J-2 engine.
c. Removing the tube assemblies, flex hoses, and check valves from the adapter flanges for the LOX and LH_2 low pressure duct purge systems, and capping the open adapter ports.

The stage final securing operations included:

a. Removing all stage tanks ground connections and installing desiccant covers.
b. Disconnecting the vehicle monitor panel lines and the hardwire instrumentation lines and capping the ports.
c. Disconnecting the LOX and LH_2 auxiliary pressurization lines, and installing a cap on the LOX open port and a flange on the LH_2 open port.
d. Disconnecting the forward and aft umbilical carrier purge lines and capping the open ports.
e. Removing the tube assembly and reducer from the prevalve actuation control module and installing a vent tube; and removing the LH_2 prevalve shaft seal drain line, and capping the open end of the flex hose.
f. Disconnecting the cold helium dump vent and capping the open port at the vehicle skirt.
g. Removing the LOX chilldown pump purge vent pigtail and capping the open tube assembly.

4.1.11.6 (Continued)

h. Removing the J-2 engine area purge installation tube assemblies, and covering the port on the flange assembly with tinfoil and tape.
i. Disconnecting the pneumatic supply flex hoses and vent connections, and capping the open ports.
j. Verifying the orifice identification tags installation.

Four revisions were written to this procedure: one provided instructions for equipment setup to support the propulsion automatic, H&CO 1B62753; one authorized disconnecting VMP lines from the Model 603 kit to facilitate stage removal; one revision authorized substituting pipe assembly, P/N 1B64416-1, for P/N 1B51259-1; and one revision deleted the requirement for attaching red streamers as this will be accomplished in the VCL.

There were no discrepancies on record.

4.1.11.7 Auxiliary Propulsion System (1B70742)

Test Explanation

This procedure defined the tests required to ascertain the functional integrity and operation of the auxiliary propulsion system (APS) modules, when mated to the stage. The checkout included:

a. Low pressure functional test of the APS valves and systems.
b. Maintainance of propellant tank bladder positioning pressures.
c. Performance of an automatic pressure scan to check ullage and sphere transducers, prior to testing the engine quad valves.
d. System leak check.

Test Review

This test was initiated on 27 June 1966, and accepted on 3 July 1966. Three revisions to the procedure included two deleting steps not required for this stage, and one substituting the numeric readout panel for strip charts, to obtain greater accuracy over a broader range of values.

One failure and rejection report, FARR A197404, noted excessive helium flow through the closed fuel recirculation port during leak check.

4.1.11.8 Auxiliary Propulsion System Automatic Checkout (1B62752)

Test Explanation

This procedure provided the automatic tasks required to check the function of the auxiliary propulsion system (APS) module engine valves. Computer commands initiated power to the engines, and supplied the signals to energize the valves for checkout. Preliminary checks included scanning the module components for correct pressure and temperature measurements, prior to functioning the valves.

Test Review

The test was performed and accepted by Engineering on 30 June 1966. Five revisions were noted on the revision documentation log sheet, including two which were not required for this test, and three correcting program errors.

4.1.12 Hydraulic System Tests, Postfiring

Three test procedures were conducted on determine the postfiring function and integrity of the stage hydraulic system. These were the hydraulic system operation and securing procedure, test stand, the VCL operation and securing procedure, and the hydraulic system automatic checkout.

4.1.12.1 Operation and Securing, Hydraulic System (1B41006 NC)

Test Explanation

This procedure defined the operations required to obtain postfire fluid samples of the closed loop hydraulic system, and to prepare the hydraulic system for stage removal from the test stand and shipment to the vehicle checkout laboratory (VCL).

Test Review

This procedure was conducted on 1 June 1966 and accepted on 2 June 1966.

4.1.12.1 (Continued)

Test Review

Two revisions were written against this procedure, deleting the procedural operations not required for this postfire test.

There were no discrepancies on record.

4.1.12.2 Setup, Operation, and Securing, Hydraulic System (1B41007 NC)

Test Explanation

This procedure provided the sequence of operations required for setup, operating, and securing the hydraulic system installation, P/N 1A39589, in the VCL, subsequent to static acceptance firing. The procedure included:

a. Hydraulic system setup.
b. Engine deflection clearance check.
c. System refill.
d. Instrumentation support.
e. Shutdown.
f. System preparation for shipment.
g. Accumulator reservoir drain hose removal.

Test Review

The test was initiated on 15 June and accepted on 4 August 1966. Seven revisions to the procedure were noted on the revision documentation log sheet, as follows:

a. Three deleted steps previously accomplished and not required.
b. Two provided instructions for obtaining closed loop fluid samples.
c. One revision provided instructions for conducting a system cleanliness check prior to shutdown.
d. One gave steps for system refill, to bring the reservoir level up to the acceptable limit.

4.1.12.3 Hydraulic System (1B71296 NC)

Test Explanation

This procedure provided the automatic and manual test sequences required to function the closed-loop hydraulic system within defined parameters for operational acceptance. Included in the test sequences were:

4.1.12.3 (Continued)

a. Accumulator precharge pressure measurement.
b. Reservoir oil volume switch and pressure transducer checks.
c. System pressure test.
d. Reservoir oil volume position transducer check.
e. Auxiliary pump inlet temperature check.
f. Accumulator reservoir oil pressure check.
g. Polarity and linearity tests.
h. Frequency response test.
i. Engine centering test.

Test Review

The test was performed on 20 July and accepted on 27 July 1966. Nine revisions to the procedure were recorded on the revision log sheet as follows:

a. Seven corrected program errors.
b. One accepted malfunction indications created by concurrent testing programs.
c. One increased the delay period for the decay of the 5 VDC power supply to the IU.

One failure and rejection report was noted during this test. FARR A192199 noted that the accumulator reservoir assembly high pressure charging valve, P/N 1B31275-1, had the stem broken off. The stem was removed and replaced per B/P.

4.1.13 Environmental Control System Tests, Postfiring

Three procedures were run to check the function of the forward and aft skirt thermo-conditioning and environmental control systems. These tests were:

a. Forward skirt thermo-conditioning system checkout.
b. Forward and aft skirt purge system checkout.
c. Aft skirt and interstage thermo-conditioning and purge system postfiring checkout.

4.1.13.1 Checkout Procedure, Forward Skirt, Thermo-Conditioning System (1B41884 A)

Test Explanation

This procedure provided instructions for the postfire operation of the forward skirt thermo-conditioning system while the stage was in the Beta Complex test stand, for the preparation of the system prior to removing the stage from the test stand and transporting the stage to the vehicle checkout laboratory, and for securing the Model DSV-4B-359 service equipment to the pre-operational status.

4.1.13.1 (Continued)

Test Review

Performed and accepted on 2 June 1966, this checkout procedure verified:

a. The capability of the forward skirt, to provide a heat sink, or source, as required, for the electrical/electronic equipment mounted on the panels.
b. The preparation of the system for stage disconnecting the associated flex hoses and tube assemblies, installing the appropriate covers, and certifying the system moisture content within the specified limit of less than 4430 ppm of water/methanol vapor (25° F dewpoint).
c. The securing of the Model DSV-4B-359 servicer. This included disconnecting and storing the associated hardware and placing the service controls in the pre-operational positions.

Four revisions were written to this procedure, pertaining to additional checkout operations previously omitted from Engineering Order 1B41884 "A" dated 4 May 1966.

There were no discrepancies on record.

4.1.13.2 Post-Countdown, Forward and Aft Skirt Purge (1B55680 A)

Test Explanation

This procedure provided for the orderly shutdown of the stage forward and aft skirt purge systems, at the termination of countdown, and prior to removal of the stage from the test stand.

Test Review

This test was conducted and accepted on 2 June 1966.

One revision was written, providing for the removal of the APS Simulator, Model DSV-4B-188C, from position III, and the removal of the APS Module from position I.

There were no discrepancies on record.

4.1.13.3 Aft Skirt and Interstage Thermo-Conditioning and Purge System Postcountdown Checkout (1B55685 NC)

Test Explanation

This procedure established the test sequences required to proof check, leak check, and functionally test the aft skirt and interstage thermo-conditioning and purge system. The sequence of tests included:

a. Pre-operation equipment setup and checkout.
b. Thermo-conditioning and purge system test operations.
c. Main manifold proof pressure test.
d. Main manifold operational flow test.
e. Post-operation securing operations.

Test Review

The test was initiated on 28 July and accepted on 2 August 1966. One revision to this procedure deleted certain tests due to GSE failure. No failures were noted during testing.

4.1.14 Electrical/Electronic Systems Tests, Postfiring

The electrical/electronic systems tests narratives are divided, for clarity of presentation, into eight sub-paragraphs, as follows:

a. Power distribution system tests - paragraph 4.1.14.1.
b. Digital data acquisition system tests - paragraph 4.1.14.2.
c. Propellant utilization system - paragraph 4.1.14.3.
d. Telemetry system tests - paragraph 4.1.14.4.
e. Range safety system tests - paragraph 4.1.14.5.
f. Single sideband system tests - paragraph 4.1.14.6.
g. Exploding bridgewire system - paragraph 4.1.14.7
h. Electromagnetic compatibility check - paragraph 4.1.14.8.

4.1.14.1 Power Distribution System Tests

Setup and checkout of the power distribution system was accomplished using three tests, which are presented in this paragraph as follows:

a. Stage power setup.
b. Power distribution system.
c. Stage power turnoff.

4.1.14.1.1 Stage Power Setup, Post-Firing (1B55836 NC)

Test Explanation

This procedure provided the operations required to verify the capability of the ACS to control and activate the stage electrical power distribution system. It was also verified that the forward and aft power busses were not subjected to excessive static loads.

Test Review

The test was performed and accepted on 13 June 1966, with no failures or revisions noted.

4.1.14.1.2 Power Distribution System (1B55838)

Test Explanation

This procedure defined the manual and automatic tasks required to ensure the functional capability of the forward and aft power distribution assemblies. The power distribution system consisted of one aft 28 VDC power source, one aft 56 VDC source, and two forward 28 VDC power sources.

Test Review

Performed and accepted on 14 and 15 June 1966, this procedure verified the capability of the power distribution system to supply electrical power to the stage systems. The various tests performed established that static loads on the power busses were not excessive, and certified the proper operation of all the power switching circuits.

Five revisions were written to this procedure. One stated that the "on" condition for the LH_2 fast fill sensor wet condition was not required for this test because the control module had been installed. A second revision noted that the LH_2 continuous vent relief override valve indicated "off" because it was carried on the same cable as the continuous vent valve. The latter was a cycle significant item which had been disconnected.

4.1.14.1.2 (Continued)

Two revisions corrected program errors; and one increased a time delay for the aft No. 2 power supply "off" condition, to permit a capacitance discharge due to a no-load condition on the battery.

There were no discrepancies on record.

4.1.14.1.3 Stage Power Turnoff, (LB55837 NC)

Test Explanation

This procedure provided the manual and automatic test sequences utilized to shut down the stage power distribution system, subsequent to the completion of the various stage system checkout procedures; and to verify the capability of the ground support equipment to control power switching to and within the stage.

Test Review

This procedure was performed and accepted on 13 and 14 June 1966.

There were no revisions and/or discrepancies on record against this procedure.

4.1.14.2 Digital Data Acquisition System Tests

Three tests were conducted in VCL, following static acceptance firing, which verified the calibration and function of digital data acquisition system (DDAS) components. These tests were:

a. DDAS calibration, manual operations.
b. DDAS calibration, automatic.
c. DDAS automatic checkout.

4.1.14.2.1 Digital Data Acquisition System Calibration, Manual Operations (LB44475B)

Test Explanation

The purpose of this procedure was to provide the supplementary manual instructions required to verify the calibration of the PCM data system during

4.1.14.2.1 (Continued)

automatic testing. The PCM system consisted of the PCM/DDAS assembly and the 600 KC voltage calibrated oscillograph (VCO) coax linkage to the ACS.

Test Review

Performed and accepted on 5 July 1966, this procedure verified the operation of the Model 270 multiplexers and the Model 301 PCM/DDAS assembly. There were no discrepancies or revisions written against the test.

4.1.14.2.2 Digital Data Acquisition System Calibration (1B55839 NC)

Test Explanation

This procedure provided the automatic and manual test sequences required to function the digital data acquisition system under prescribed design parameters, and to monitor the performance of each item tested. Elements of the pulse amplitude modulated and pulse coded modulated stage telemetry systems comprised the composite data linkage for the digital data acquisition system.

Functionally verified included:

a. Model 270 multiplexers (individually checked)
b. Digital data acquisition assembly.
c. Digital data acquisition subsystem ground station.
d. Data channel input impedance.

Test Review

This checkout procedure was performed on 11 July and accepted on 18 July 1966. Eleven revisions were written against this procedure: six pertained to program changes, deleting and adding steps to improve the testing technique; two corrected program errors; two revisions accepted on out-of-tolerance voltage measurement for the 5 VDC excitation module; and one revision accepted the initial scan conditions as not detrimental to this checkout procedure. There were no discrepancies on record.

4.1.14.2.3 Digital Data Acquisition System (1B55840 NC)

Test Explanation

The purpose of this procedure was to provide operational status verification of all stage data channels. This included the operation of all signal conditioning units and their associated amplifiers, the command calibration channel decoders, the multiplexers, the digital data acquisition assembly, and the central command calibration decoder assembly.

Test Review

This checkout was initiated on 14 July 1966 and accepted on 27 July 1966. A total of sixty revisions were noted on the revision log sheet, as follows:

a. Thirty-eight corrected errors in the program.
b. Thirteen covered conditions resulting from components not installed or temporarily disconnected.
c. Nine allowed out-of-tolerance measurements due to faulty transducers and shorted pins in a connector.

Eleven failure and rejection reports were written during the course of this test. Of these, six remained unresolved at the time of stage shipment to FTC. The FARR's were:

a. FARR A188242 noted that Q-meter, P/N 1B52861-1, S/N 4, had sporadic output with both high and low racs calibration signal, when a 28 VDC signal was applied. The meter was returned to the vendor for rework.
b. FARR A191950 noted that pressure transducer, P/N 1B40242-507, S/N 507-3, read high on the low end of the scale. The transducer was retested and accepted for use.
c. FARR A192190 noted that transducer 410MT604, P/N 1A68589-503, S/N C85, failed during run 2A of the static acceptance firing. The transducer was replaced.
d. FARR A197290 reported that valve, P/N 1B51753-501, S/N 00001, would not regulate properly. The valve was reworked per SEO 1B51753-004.
e. FARR A197424 noted that pin V of plug J-4 on multiplexer, P/N 1B29741-563, S/N 00001, was bent 45°. The pin was straightened.
f. FARR A197425 reported that pressure transducer, P/N 1B40242-523-001, had high readings on the high end. The transducer was routed to the lab for further testing, and was accepted.
g. FARR A204804 noted that pressure transducer, P/N NA5-27316-T5T, S/N 2889, which had been removed and replaced per FARR A204835, was found to be open on resubmit. The transducer was returned to the vendor for rework or replacement.

4.1.14.2.3 (Continued)

Test Review

h. FARR A204810 noted a ding in duct assembly, P/N 1A87234-1. This problem was unresolved at STC turnover to FTC, and the FARR remained open.
i. FARR A204813 reported incorrect pressure indications from transducer 403MT670, P/N 1A97442-1, measurement D200. The transducer was returned to the lab for retest, and accepted.
j. FARR A204833 indicated that, upon removal of the transducer noted on FARR A197425, the transducer and associated tubing had metal chips and brown discoloration on the inside surface. This problem was under investigation at the time of turnover, and the FARR remained open.
k. FARR A204835 noted that the transducer rejected per FARR A204804 had ambient low racs reading. The transducer was removed and tested further, and was accepted.

4.1.14.3 Propellant Utilization System (1B55845 NC)

Test Explanation

This procedure provided the steps required to verify the operation of the propellant utilization (PU) system. The checkout included verification of the proper application of stimuli transmitted to the stage interface, and the patching of each response through specific response conditioner channels.

Test Review

The test was conducted on 27 June and accepted on 18 July 1966. Nine revisions to the procedure were noted, as follows:

a. Five corrected minor program errors.
b. Two accepted certain out-of-tolerance readings.
c. One increased delay time to ensure complete reception of multiplexer signals.
d. One increased talkback tolerances to compensate for talkback voltages introduced by ground support equipment patching.

There were no discrepancies written against this procedure.

4.1.14.4 Telemetry System Tests

The postfiring operational status of the PAM/FM/FM telemetry system was verified by two procedures. These were:

a. Telemetry system, manual operations.
b. Telemetry system, automatic checkout.

4.1.14.4.1 Telemetry System, Manual Operation (1B57859 NC)

Test Explanation

The purpose of this test was to provide the manual steps necessary to set up, align, and test the FM/FM telemetry system. The test was run in conjunction with automatic H&CO 1B55843. Functions included were:

a. Subcarrier oscillator (SCO) bandedge adjustment.
b. Manual setup for channel verification.
c. SCO pre-emphasis verification.
d. Final transmitter deviation check.
e. Transmitter center frequency check.
f. Flight recorder check.
g. Program plug check.

Test Review

The test was initiated on 11 July and accepted on 27 July 1966. The following four revisions appeared on the revision documentation log sheet:

a. One disconnected the PCM transmitter so that the center frequency of the transmitter switching assembly output could be measured accurately.
b. One deleted the SCO adjustment because no malfunctions had been noted during automatic checkout.
c. One deleted a test on a non-flight tape recorder.
d. One deleted the requirement for data reduction because analysis of oscillograph readings indicated acceptable data.

No failure and rejection reports were written against this procedure.

4.1.14.4.2 Telemetry System, Automatic Checkout (1B55843 NC)

Test Explanation

This procedure provided the automatic sequences required for calibration and verification of the telemetry system. Included in the sequences of tests were:

a. Subcarrier oscillator (SCO) bandedge adjustment and associated pre-emphasis schedule verification.
b. Telemetry calibrator performance verification.
c. Telemetry channel verification of the FM/FM system measurements, including the PAM multiplexers.
d. Operation of the PAM data train.
e. Operation of the antenna system, including the measurements for transmitter power output, open-loop and closed-loop VSWR, and insertion losses.

4.1.14.4.2 (Continued)

Test Explanation

f. Transmitter center frequency measurements.
g. Tape recorder operation in the bypass, fast-record, slow-record, and playback modes, and evaluation of data accuracy degradation.
h. Verification of program plug wiring for each SCO mounting assembly.

Test Review

The test was performed on 21 July and accepted on 27 July 1966. Eight revisions to the procedure were recorded, as follows, on the revision log sheet:

a. Three required channel verification after transducer installation.
b. One accepted initial scan discrepancies as not detrimental to this test.
c. One called for changes in current and power requirements for the redesigned transmitters.
d. One revision corrected a program error.
e. One deleted tests on a non-flight tape recorder.
f. One compensated for the out-of-tolerance condition of the breakpoint amplifier for reflected power antenna 1.

One failure and rejection report pertained to the above breakpoint amplifier. FARR A204811 noted that the amplifier, P/N 1B54875-1, had incorrect output. The amplifier was removed and routed to the lab for further testing.

4.1.14.5 Range Safety System Tests

Three test procedures were included to check the capability of the range safety system to terminate flight and initiate propellant dispersion on command. These tests were:

a. Range safety receiver manual checkout.
b. Range safety receiver automatic checkout.
c. Range safety system.

4.1.14.5.1 Range Safety Receiver, Manual Operations (1B44477 A)

Test Explanation

This procedure provided instructions for the test equipment setup and manual operations to be performed in conjunction with the automatic range safety system tests, H&CO's 1B55841 and 1B55844. The flight readiness of the range safety receiver system was determined by these tests.

4.1.14.5.1 (Continued)

Test Review

The procedure was conducted and accepted on 2 July 1966. Three revisions to the procedure were noted in the revision documentation log sheet as follows:

a. One provided instructions for the performance of deviation threshold and open loop RF checks, with the system operating in the linear mode.
b. Another revision contained steps for performance of open loop RF tests, with the maximum input to the least sensitive receiver not to exceed 10 microvolts.
c. One revision accepted a 10 per cent deviation due to raise in a high level measurement.

4.1.14.5.2 Range Safety Receiver Automatic Checkout (1B55841 NC)

Test Explanation

The purpose of this procedure was to provide the necessary operations to verify the function of the range safety receivers. Included in the test were certification of the range safety receivers for automatic gain control calibration and drift, minimum acceptable deviation sensitivity, and minimum acceptable RF sensitivity.

Test Review

This test was initiated on 6 July and accepted on 18 July 1966. Eleven revisions were noted against the procedure, as follows:

a. Five changed the automatic test sequences to coincide with the manual setup.
b. Two corrected minor errors in the program.
c. Two provided instructions for determining the automatic gain control curve for the No. 2 range safety receiver.
d. Two accepted out-of-tolerance measurements as not detrimental to this checkout.

4.1.14.5.3 Range Safety System (1B55844 NC)

Test Explanation

The purpose of this procedure was to verify the operation of the redundant range safety system. The checkouts conducted included:

4.1.14.5.3 (Continued)

Test Explanation

a. Exploding bridgewire and receiver external/internal transfer test.
b. Engine cutoff test.
c. Exploding bridgewire pulse sensor and propellant dispersion command inhibit test.
d. In-flight securing test.
e. Arm and engine cutoff command test.
f. Propellant dispersion command test.
g. Safe and arm device test.

Test Review

This procedure was performed on 5 July and accepted on 18 July 1966, with no revisions or functional failures noted.

4.1.14.6 Single Sideband System Tests

Two tests were run to verify the calibration and function of the single sideband system. They were:
a. Single sideband system, manual operations.
b. Single sideband system, automatic checkout.

4.1.14.6.1 Single Sideband System, Manual Operations (1B57860 NC)

Test Explanation

This procedure provided the manual test sequences required to ascertain the single sideband (SSB) system calibration and the GSE status, prior to automatic checkout per H&CO 1B55842. The checks included:
a. Marker channel verification.
b. Preflight sweep calibration.
c. Channel verification.
d. Inflight calibration.
e. Transmitter deviation and information transmission check.

Test Review

The test was initiated on 28 June and accepted on 21 July 1966. Four revisions were noted on the revision log sheet, as follows:
a. One identified additional end item test equipment.
b. One increased the channel amplitude tolerance parameter.
c. One revision authorized altering data sheets to correspond with stage channel assignments.

4.1.14.6.1 (Continued)

Test Review

d. One accounted for out-of-tolerance channels noted below.

Four failure and rejection reports were written during the course of this test, as follows:

a. FARR A191912 noted that the output at pin D, accelerometer 427MT604E119, P/N 1A68707-525; S/N 254, was 60 cycle, 3.4 VRMS. Output should have been 400 cycle, 4 volts peak to peak. The amplifier was recalibrated and retested without incident.
b. FARR A204815 noted that accelerometer 411MT670, S/N E93, malfunctioned. The accelerometer was routed to the lab for retest, and the FARR remained open at turnover.
c. FARR A204816 noted a similar malfunction of accelerometer 411MT687. The accelerometer was retested and accepted.
d. FARR A204817 reported a malfunction of acoustical transistor 426MT612, S/N B013.

4.1.14.6.2 Single Sideband System (1B55842 NC)

Test Explanation

This procedure provided the test sequences required to function and monitor the single sideband system. The general sequence of tests included:

a. Power distribution to single sideband equipment.
b. Sequence commands.
c. Remote automatic calibration assembly (RACS).
d. Marker channel verification.
e. Preflight sweep calibration and translator unit check.
f. Channel verification.
g. Transmitter deviation and output check.

Test Review

This test was performed on 22 July and accepted on 27 July 1966. One revision to the procedure repeated the channel verification test, as the 400 cps acoustical oscillator output voltage level had been adjusted incorrectly.

No failure and rejection reports were written.

4.1.14.7 Exploding Bridgewire System (1B55846 NC)

Test Explanation

This procedure defined the manual setup and automatic test sequences required to verify the capability of the exploding bridgewire (EBW) system to initiate ullage rocket ignition and jettison, when so commanded in flight by the instrument unit.

Test Review

Performed and accepted on 22 June 1966, this test included the following:

a. Preliminary EBW firing unit and pulse sensor test.
b. EBW firing unit ignition pulse sensor self test.
c. Ullage rocket EBW firing unit test.
d. Ullage rocket jettison firing unit test.

The firing units were charged by applying a stepped up charging signal to a storage capacitor (2300 volts). A second signal was stepped up to 5000 volts to trigger a gap tube, and, as the tube ionized, the storage capacitor discharged through the EBW detonator.

One revision was written to this procedure, deleting portions of the procedure not required for this test.

4.1.14.8 Electromagnetic Compatibility Check (1B64969 NC)

Test Explanation

This procedure provided the setup and operating instructions for the special electromagnetic compatibility test equipment used during the simulated all systems flight test, H&CO 1B55833. Included was verification that the stage RF systems were capable of operating within the electromagnetic compatibility acceptance range.

Test Review

This test was conducted and accepted between 15 and 27 July 1966. Four revisions were written to the procedure, including two modifing non-flight circuit

4.1.14.8 (Continued)

Test Review

boards for this test; and two correcting errors in oscilloscope connection callouts and the Model 131 power supply output.

There were no discrepancies written against this procedure.

4.1.15 All Systems Test (1B55833 A)

Test Explanation

This procedure described the test sequences required to simulate propellant loading, liftoff, separation, ignition, flight, shutdown, and restart of the stage. The major events in the sequence of occurance included:

a. Stage power setup.
b. Initial conditions scan.
c. Electrical setup.
d. Propulsion and pneumatic setup.
e. Prelaunch preparations.
    1. Instrumentation system calibration.
    2. Purging.
    3. Simulated loading, chilldown, and prepressurization.
    4. Battery simulators on.
    5. External/internal power transfer.
f. Liftoff.
g. Stage separation and ullage firing.
h. Engine start sequence.
i. Hydraulic test and engine gimballing.
j. Range safety engine cutoff.
k. Depletion sensor engine cutoff.
l. Switch selector engine cutoff.
m. Coast mode.
n. Engine restart sequence.

Test Review (Run 1A)

This run was performed on 28 July 1966 and accepted on 8 August 1966. Twenty-one revisions to the procedure appeared, as follows, on the revision documentation log sheet:

a. Thirteen corrected errors in the program and/or test request document.
b. Two accepted out of tolerance conditions which did not affect the intent of the procedure.
c. One revision provided instructions for manually resetting three electrical functions after shutdown of bus power.

4.1.15 (Continued)

Test Review (Run 1A)

d. One revision introduced a breakpoint to provide additional time for the EBW pulse sensor power to go off, and the range safety propellant dispersion safe power to come on.
e. One removed the LH_2 continuous vent because it had cycled the maximum allowable number of times.
f. One increased the reflected power measurement tolerance for open-loop transmission to the data laboratory.
g. One revision gave steps for rewinding the tape recorder prior to commencing the second portion of the all systems test.
h. One turned on the propellant utilization inverter and electrical power per pre-test setup instructions.

4.1.16 Auxiliary Propulsion System Tests

The following eight procedures describe prefiring, acceptance firing, and postfiring activities on APS modules, S/N's 1005-1 and 1005-2. APS module one was static fired on 6 May 1966 per test request 2075, and acceptance firing of APS module two took place on 13 May 1966 per test request 2076. Each of the following procedures was conducted separately for each module.

4.1.16.1 APS Controls and Instrumentation Inter-face Electrical Checkout (1B60951 NC)

Test Explanation

This procedure consisted of resistance and limited power checks to verify the following:

a. That power could safely be applied to the APS interface connectors.
b. That the resistance measurements obtained met or exceeded Engineering specifications.

Test Review

Each module was tested twice, once before the APS engine acceptance firing, and once after. APS module one was tested for interface compatibility for the first time on 18 and 19 April 1966, and for the second time on 6 May to 23 June 1966. A revision to the first run deleted measurements for parts not installed. APS module two was tested prefiring from 27 April to 2 May 1966,

4.1.16.1 (Continued)

Test Review

and postfiring testing took place between 13 May and 13 June 1966. No revisions were noted for either run.

FARR A192127 noted that temperature transducers, P/N 1A68589-509, S/N's A681 and A738, on module two, read open when installed. They were returned to the vendor for replacement.

4.1.16.2 APS Prefiring Test Preparation (1B60957 NC)

Test Explanation

This procedure prepared the APS modules for prefiring testing, by detailing the test equipment and setups required for these tests.

Test Review

APS module one was tested per this procedure on 2 May 1966, and accepted on 10 May 1966. Three revisions to this run provided for purging the system for five minutes with GN_2 to remove all freon; adding a spacer sight glass assembly to prevent the APS rivet heads from being marred; and deleting a test, adding a water system to aspirator 4, and denoting the method of installation for this aspirator.

APS module two was tested on 11 May 1966, and certified on 17 May 1966. A revision was written to delete a step which was no longer necessary for this test.

4.1.16.3 Auxiliary Propulsion System Checkout (1B60958)

Test Explanation

This procedure was designed to verify that the APS modules would function, free of leaks, per design requirements. Tests included were as follows:

a. Helium tank leak and functional checkout.
b. Critical valve functional checkout.
c. Test of leak detection system.
d. Leak check of the propellant control module check valves.
e. Pressurization system leak and functional check.
f. Quad check valve low pressure leak check.
g. Leak check at full operating pressure.
h. Blanket pressure decay check.

Test Review

These checkouts were conducted on APS module one between 23 April and 10 May 1966, and on APS module two between 2 and 10 May 1966. Five revisions were written against the run on module one, as follows:

a. One set up new procedure for the low pressure helium relief valve check.
b. A revision reran a step to obtain a clearer printout.
c. One deleted unneccessary steps from the procedure.
d. Another set up a new Apollo regulator test, and deleted several pages.
e. One revision disconnected lines and plugs to prepare the APS for shipment to cell 3.

One failure and rejection report, FARR A179095, noted out-of-tolerance operation of the high pressure helium relief valve. The valve was accepted.

Ten revisions to the run on APS module two included:

a. Three incorporating all those revisions which had been written against module one.
b. One providing for the activation of the test stand at the beginning of each shift.
c. Three retesting engine 2 quad valves and replacing the engine. (Ref: FARR A179093).
d. One setting up a procedure for testing the replacement engine system.
e. One deleted steps not required.
f. A revision provided a method for purging residual freon from GSE and module suitcases.

FARR A179093 pertained to a stuck quad valve in engine No. 2. The engine was replaced.

4.1.16.4 Countdown Manual - APS Module Static Acceptance Firing (1B60943 NC and 1B60944 NC)

Test Explanation

This countdown manual described the tasks which comprised the static acceptance firing activities for the APS modules. Of the fifteen individual tasks specified in this procedure, nine involved personnel assignments and equipment setup, and one was deleted in its entirety by a revision. The remaining five were as follows:

a. Task 1 - Verify power setup and safety requirements.
b. Task 10 - Loaded propellants, and purged the propellant systems after firing.
c. Task 11 - Static firing, including pressurization and depressurization.
d. Task 12 - Unloaded propellants.
e. Task 13 - Flushed the propellant tanks assembly with freon, and purged with GN_2.

Test Review

The countdown/acceptance firing/post countdown activities were run on APS module one between 5 and 9 May 1966. Acceptance firing took place on 6 May, and the test results were certified on 10 May.

Two revisions to task 10 permitted all modifications necessary to install the No. 1 and 3 engine aspirators. Two revisions to task 12 deleted steps previously accomplished. Two revisions to task 13 involved securing the site and deleting steps.

The same tasks were run on APS module two, as countdown manual, H&CO 1B60944, between 5 and 13 May 1966. A revision to task 10 involved installation of engine aspirators, and two revisions to task 12 provided helium for unloading GN_2, and deleted steps not required. Five revisions to task 13 included the following:

4.1.16.4 (Continued)

Test Review

a. One gave instructions for application of 15 psig blanket pressure to the oxidizer servicer storage tank.
b. One disconnected the calibration tank from the fuel servicer.
c. One added procedures for calibrating the engine P/C transducers.
d. One allowed a hold and X-rays for checking gas permeation through the oxidizer bladder.
e. One provided for calibration to update the program.

4.1.16.5 APS Postfiring Disassembly/Reassembly (1B60959 NC)

Test Explanation

The postfiring disassembly of the APS modules was conducted in order to permit decontamination of the propellant tanks and associated hardware. The modules were reassembled per this procedure prior to postfiring checkout.

Test Review

APS module one was disassembled, decontaminated, and reassembled per this procedure on 9 May 1966; however, sealing compound was not available to seal the engine nozzle to its support bracket. The procedure remained open pending sealant. No revisions or failures were noted during the decontamination of this module. APS module two was disassembled in the identical manner on 14 May 1966; however, proper handling procedures for tubing with temperature patches was noted in one revision. There were no functional failures reported.

4.1.16.6 APS Postfiring Decontamination procedure (1B60962 NC)

Test Explanation

This procedure contained the steps required to dry and purge the APS modules subsequent to static acceptance firing.

4.1.16.6 (Continued)

Test Review

APS module one was dried and purged with GN_2 on 12 May to 20 May 1966. One revision to this procedure deleted steps which were no longer required. APS module two was purged and dried by 26 May 1966. A revision to this run included certain tube assemblies in the drying process.

4.1.16.7 APS Electrical Control System Checkout (1B60954 NC)

Test Explanation

The purpose of this procedure was to check out the electrical/electronic equipment in the APS system, both prior to and subsequent to static acceptance firing of the APS engines. Functions conducted included electronic verification of actuation of quad valves, continuity checks of wiring, and check of switches and solenoids in the modules.

Test Review

Both APS modules were electrically checked out without incident, both before and after acceptance firing. APS module one was checked for the first time between 18 and 23 April 1966, and postfiring checkout took place between 6 and 26 May 1966. The only revision to these runs deleted GSE checkouts, as these had been done previously. APS module two was electrically checked between 27 April and 3 May 1966, prior to firing. Postfiring checkout of this module was run between 1 and 6 June 1966. GSE checkout was deleted from these runs.

4.1.16.8 APS Postfire Checkout (1B60960 NC)

Test Explanation

This procedure was conducted to check out the integrity and operation of the APS modules following static acceptance firing. The following functions

4.1.16.8 (Continued)

Test Explanation

were included:

a. Critical valves functional checkout.
b. Propellant control module check valve leak check.
c. Quad check valve cracking pressure test.
d. Quad check valve leak check.
e. Low pressure helium relief valve check.
f. Apollo regulator checkout.
g. Engine valve current signatures.
h. Engine injector valve package leak check.
i. Engine chamber leak check and chamber transducer checkout.
j. Full operating pressure leak check.
k. Oxidizer system purge.
l. Fuel system purge.
m. Ullage system purge.
n. Blanket pressure decay check.
o. Propellant tank fit check and bladder checkout.

Test Review

APS module one was tested per this procedure between 20 May and 6 June 1966, with acceptance of the results taking place on 14 June 1966. Fourteen revisions were written against this run, as follows:

a. One required the apollo regulator high pressure checkout, because the regulator had been changed subsequent to static firing.
b. One added a leak check for check valve, P/N 1B51361-1.
c. Two provided for activation of the test facility at the start of each shift.
d. One added procedures to check out transducers under pressure.
e. One reran engine transducer checkouts.
f. One called for reverification of facility lines.
g. One required checkout of a replacement oxidizer manifold.
h. One revision modified the full operating pressure leak checks, and set certain allowable leakage limits.
i. One provided correct orificing of fuel and oxidizer instrumentation kits for bladder checkouts.
j. One revision provided methods for allowing lube gas to vent from the tank, and for supplying GN_2 to the fuel instrumentation kit.
k. Another gave instructions for investigating the extent of thrust chamber injector leakage.
l. One provided steps for sealing the leakage around the throat lines during the thrust chamber injector leak check.
m. A final revision reran engine 2 thrust chamber leak checks, using GN_2 and helium.

4.1.16.8 (Continued)

Test Review

APS module two was checked out for post firing integrity between 2 and 10 June 1966. Five revisions were written to the procedure, including the apollo regulator high pressure check and a check of the integrity of the helium check valves.

FARR A179100 noted a scratch in a tube assembly in the oxidizer manifold system, causing excessive leakage in the flange end. The manifold assembly was removed in order to replace the tube assembly. The manifold was then replaced in module one.

4.1.17 Weigh and Balance (1B55602)

The stage weigh and balance procedure was conducted in such a manner as to accurately measure the stage preflight weight, and to determine the horizontal center of gravity from the results.

The stage weight in air was found to be 28,107.15 pounds, and the weight adjusted for Standard Locality in a vacuum was 28,159.18 pounds. The longitudinal center of gravity was located at Station 339.91.

No functional failures occurred during weigh and balance activities, which were conducted and accepted on 11 August 1966.

4.1.18 System Tests Not Included

Two system checkouts which were completed at the time of turnover, were not available for narrative writeups at press time. These were:

a. Structures inspection, H&CO 1B70756
b. VCL thermo-conditioning system checkout, H&CO 1B57599.

4.2 Stage Checkout, Space Systems Center

Paragraph 4.2 narrates the tests performed on the stage after basic assembly, prior to shipment from Douglas SSC to STC. The stage entered tower 5 of the SSC/VCL on 15 November 1965. System checkouts were initiated on 22 November 1965, and continued until 29 January 1966. At this point, the stage was removed from the tower, and prepared for shipment.

Paragraphs 4.2.1 to 4.2.6 contain information of the six major areas tested: Umbilical Mechanical Mating; Environmental Control Systems; Electrical/Electronic Systems; Engine Alignment; APS Simulation; and Hydraulic Systems.

Because of schedule and parts shortages, a number of planned tests were not performed at SSC/VCL. Paragraph 4.2.7 indicates the tests that were not conducted at SSC.

4.2.1 Umbilical Mechanical Mating

Two test procedures were conducted to perform mechanical mating checks on the forward and aft umbilical kits. The umbilical kits are the interface link connecting the stage to GSE electrical, pneumatic, and air conditioning functions, and must be properly mated before stage systems tests can be conducted.

The two procedures involved in this check are:

a. Umbilical kit, aft - checkout stand.
b. Umbilical kit, forward - checkout stand.

4.2.1.1 Umbilical Kit, Aft - Checkout Stand (1B57918)

This procedure was conducted to install the aft umbilical kit, P/N 1A57917-1, at the stage aft umbilical panel, and to ensure proper alignment and mating of the umbilical kit and the stage umbilical panel.

The test was run on 2 February 1966, with acceptance taking place on the same date. Eight revisions were recorded on the documentation log sheet. Five deleted paragraphs; one because a hoist was not available, and four because the steps were not required for this vehicle. Two added items; one to eliminate interface between ring and support, and one to provide for removal of the carrier assembly. One revision corrected a typographical error.

No discrepancies were noted during this procedure.

4.2.1.2 Umbilical Kit, Forward - Checkout Stand (1B57920)

This document provided handling and installation procedures for the forward umbilical kit. The kit was mated with the stage umbilical panel on 2 February 1966, and the procedure was reviewed and accepted on the same date.

There were four revisions noted on the revision log sheet. Two deleted steps not required for this stage, one added a paragraph to provide for the removal of the carrier assembly, and one corrected a typographical error.

No failures were recorded during this procedure.

4.2.2 Environmental Control Systems

Three test procedures were performed involving the forward skirt thermo-conditioning system and the Model DSV-4B-359 GSE thermo-conditioning servicer. The tests prepared the thermo-conditioning system and servicer for operation, controlled their operation during stage checkout, and shut them down after checkout completion. The forward skirt thermo-conditioning system provides a temperature controlling heat sink for all stage electrical and electronic equipment located in the forward skirt area. During all ground checks involving this electrical equipment, the model 359 servicer provides the water/methanol coolant for the thermo-conditioning system, and maintains coolant circulation, flow-rate, and temperature, within the required limits.

The three tests performed on the forward skirt thermo-conditioning system were:

a. Precheckout procedure.
b. Operating procedure.
c. Postcheckout procedure.

4.2.2.1 Pre-Checkout Procedure, Thermo-Conditioning System, Forward Skirt (1B41932)

Test Explanation

This test was conducted to verify that the thermo-conditioning system was able to support automatic checkout activities.

Test Review

This test was started on 10 December 1965, and was accepted on 13 December 1965. The revision documentation log sheet listed the following eighteen revisions:

4.2.2.1 (Continued)

a. Six changes in procedure were made in order to conform to NASA requirements.

b. Two deleted steps which were unnecessary because a leak check had previously been run to an identical procedure.

c. Three deleted paragraphs from the procedure; one because hardlining the facility GN_2 to the servicer made it unnecessary to close the GN_2 valve for hookup, one deletion involved draining excess fluid from the reservoir, and one deleted paragraph noted that the GN_2 valve was frozen open.

d. Four added paragraphs to the procedure; one to provide means for preventing pressure buildup in the stage, one to provide for draining excess fluid, one to prepare for hooking the servicer to the stage, and one to provide for entering the particle count of the fluid added to the reservoir.

e. Two revisions were found to be unnecessary and were deleted.

f. One changed a paragraph because sell out of the procedure had to be accomplished before performing the step.

No discrepancies were noted against this procedure.

4.2.2.2 Operating Procedure, Thermo-Conditioning System, Forward Skirt (1B42130)

Test Explanation

This procedure provided instructions for operating the forward skirt thermo-conditioning system, P/N 1B38426-507, in the stage, and to set up and operate the model DSV-4B-359 servicer during automatic checkout activities.

Test Review

This test began on 17 December 1965 and was accepted on 9 February 1966. Seven revisions were noted on the revision documentation log sheet, as follows:

a. One changed a drawing number which was typed incorrectly.

b. One eliminated a requirement for checking servicer gauge calibration stickers, because gauge calibration was accomplished during servicer certification.

c. Three deleted sentences requiring control of the GN_2 source, because this source was controlled at the facility, rather than at the servicer.

d. One deleted a time limit which could not be complied with prior to sellout of document.

e. One deleted a requirement that entries on the test record be verified by AFQA and Douglas personnel, because verification was obtained on the time data sheet.

No failures were recorded in the course of this procedure.

4.2.2.3 Post-Checkout Procedure, Thermo-Conditioning System, Forward Skirt (1B55439)

Test Explanation

This procedure provided checks for system cleanliness and leaks, and included instructions for preparing the thermo-conditioning system for shipment. The cleanliness test showed that the water/methanol system was free of contaminants, and the leak check ensured that leakage was not in excess of specified values. Preparation for shipment involved ensuring that the system moisture content was within specified limits.

Test Review

This checkout was initiated on 30 January 1966, and was completed without major difficulties on 2 February 1966. Seven revisions were made, and recorded on the revision documentation log sheet as follows:

a. Three changed paragraphs in order to make possible a better indication of system dryness.

b. One deleted the requirement for weighing the servicer freon bottle, because no leak checks were conducted on the servicer during this test.

c. One required that the air valve port be re-opened slightly to prevent trapping moisture.

d. One paragraph was deleted because the parts called out were not available.

e. One deleted a test completion time limit because the limit could not be complied with prior to sellout of the document.

No discrepancies were recorded against this procedure.

4.2.3 Electrical/Electronic Systems

The various manual and automatic test procedures used to check out the stage electrical and electronics systems are presented in this paragraph. The paragraph is divided into ten subparagraphs for presentation, with each subparagraph concentrating on one particular area of interest. These areas are:

a. Continuity compatibility tests - paragraph 4.2.3.1.

b. Power distribution tests - paragraph 4.2.3.2.

c. Signal conditioning test - paragraph 4.2.3.3.

d. Digital data acquisition tests - paragraph 4.2.3.4.

e. Exploding bridgewire test - paragraph 4.2.3.5.

4.2.3 (Continued)

f. Propellant utilization tests - paragraph 4.2.3.6.
g. Level sensor and control unit calibration test - paragraph 4.2.3.7.
h. Cryogenic probe verification - paragraph 4.2.3.8.
i. Telemetry and range safety antenna system test - paragraph 4.2.3.9.
j. Electromagnetic compatibility checks - paragraph 4.2.3.10.

4.2.3.1 Continuity Compatibility Checks

Three test procedures were conducted to verify the proper continuity of the stage electrical wiring, and the compatibility of the wiring with the stage electrical and electronics equipment, with other stages or components of the Saturn S-V vehicle through the stage interface panels, and with GSE equipment through the stage umbilical panels.

The three tests conducted were:

a. Continuity compatibility check.
b. Forward and aft interface compatibility check.
c. Umbilical interface compatibility check.

4.2.3.1.1 Continuity Compatibility Check (1B44541)

Test Explanation

The purpose of this test was to ensure the integrity of the stage wiring system prior to the application of bus power. Every wire was checked for continuity from end to end, through component boxes where possible. Insulation resistance between the pins in each plug, and between each pin and the connector shell, was measured.

Test Review

This test began on 22 November 1965, and was accepted on 31 January 1966. Ninety-seven revisions were recorded on the revision documentation log sheet, as follows:

a. Forty-five corrected minor errors in the procedure.
b. Twenty were written to correct errors in the schematic.
c. Ten revisions were deleted because they were made in error.
d. Nine changed measurement procedures because of parts shortages or inaccessibility.
e. One revised the procedure to agree with the schematic.

4.2.3.1.1 (Continued)

f. Two added jumper wires where parts had not been installed.

g. Three changed tolerances, or allowed measurements, as demanded by changes in parts used.

h. Two redesignated items called out in the procedure.

i. Two were made to clarify points in the procedure.

j. Two deleted unnecessary steps from the procedure.

k. One allowed for the hookup of the Umbilical Cables.

There were five failure and rejection reports written during this test:

a. FARR A174426 recorded that plug P7 of wire 404A3W1 in wire harness, P/N 1B50159-1, S/N 00002, had the insert arrangement of its pins rotated 180°. The plug was removed and replaced.

b. FARR A174427 noted that contact P of connector J-4 was bent. The contact was straightened and accepted.

c. FARR A174428 noted that the insert of connector 404W219-P8 was punctured by pins P and S. This was accepted as is.

d. FARR A174429 recorded a discontinuity between points J-2, pin I and J-1, pin I of module 404A3A39, P/N 1B39975-1, S/N 00039. This was accepted without rework.

e. FARR A174441 noted that pin A of plug P33 of wire 404-W7, wire harness, P/N 1B50045-1K, was recessed. Plug P33 was removed and replaced.

4.2.3.1.2 Forward and Aft Interface Compatibility Check (1B44542)

Test Explanation

This test was conducted to check the continuity from the interface connections to the stage ground, and to ensure that loads present provided proper power input without damaging the stage.

Test Review

This test began on 9 December 1965. The results obtained were accepted on 22 January 1966. Six revisions were recorded on the revision documentation log sheet, as follows:

a. One widened the tolerance on the resistance of the relay coils.

b. One specified the installation of a shorting jumper between two pins because shortage of a 5-volt excitation module prevented continuity measurement.

c. One corrected a minor procedure error.

4.2.3.1.2 (Continued)

d. Two changed required resistance readings to "infinite" because of parts not installed.

e. One changed test points because umbilical cables were not installed.

No discrepancies were noted against this procedure.

4.2.3.1.3 Umbilical Interface Compatibility Check (1B44543)

Test Explanation

This test was connected to verify continuity from the GSE umbilical connectors to the stage ground, and to assure that proper loads were present to allow for proper power input without damage to the stage.

Test Review

This test began on 4 January 1966, and was certified on 9 February 1966. There were three revisions noted on the revision documentation log sheet:

a. One deleted most of the measurements because the procedure was cancelled by agreement with NASA.

b. A line was deleted because the measurement called out could not be made.

c. One corrected a procedure error.

No failures are on record for this procedure.

4.2.3.2 Power Distribution Tests

Three test procedures were run to check the capability of the stage power distribution system to control electrical power functions within the stage. The capability of the GSE automatic checkout equipment to control power function turn on and turn off by computer command was also checked.

The three automatic checkout procedures are:

a. Stage power setup.

b. Stage power turnoff.

c. Power distribution system.

4.2.3.2.1 Stage Power Setup (1B55789)

Test Explanation

This procedure verified the capability of the ACS to control and activate the vehicle electrical power distribution system prior to automatic system checkout

4.2.3.2.1 (Continued)

procedures, and ensured that the forward and aft power distribution system was not subjected to excessive static loads during initial setup sequences. The following functions were checked:

a. Setup of a group of initial conditions, (i.e. activation of power buses) required for further testing of other stage components and systems.
b. Power distribution.
c. Interrupts.

Test Review

This test was run on 5 January 1966, and accepted on the same day. Fourteen revisions were recorded on the revision documentation log sheet, as follows:

a. Five corrected minor errors in the procedure.
b. Three added items omitted from the procedure.
c. Two changed the program.
d. One was deemed unnecessary and voided.
e. One deleted a measurement not necessary for this test.
f. One changed the list of end item requirements to include only those items necessary for this test.
g. One changed the EBW pulse sensor requirement from on to off, because it was checked before aft bus I was turned on.
h. One called for the installation of jumpers to provide IU system connection from the BO multiplexer to the PCM/DDAS assembly.

No discrepancies were noted during this test.

4.2.3.2.2 Stage Power Turnoff (1B55790)

Test Explanation

This procedure was designed to shut down the stage power distribution following completion of various system checkout procedures.

Test Review

This test was run on 7 January 1966. Certification took place on 17 January 1966. One run was required for satisfactory completion, with the following seven revisions tabulated on the revision log sheet:

a. Two steps were deleted because they were not necessary for this procedure.
b. One revision corrected an error in the procedure.

4.2.3.2.2 (Continued)

c. Three added steps to the program.

d. One deleted all end item test equipment not necessary for this test.

No discrepancies were recorded against this procedure.

4.2.3.2.3 Power Distribution System (1B55791)

Test Explanation

This procedure verified the operational capability of the power distribution system, using the ACS to determine if the system would meet or exceed engineering specifications. The following functions were to be checked:

a. Verification that static loads on power buses were within specified tolerances.

b. Verification of proper operation of all switching circuits required for power distribution.

Test Review

The test was run successfully on 20 January 1966, and the resultant data were accepted on 26 January 1966. The revision documentation log sheet noted twenty revisions to the procedure, as follows:

a. Three added items which were omitted from the procedure.

b. Five deleted steps from the program, either because the measurements were not required, or to allow for parts shortages.

c. One corrected a minor error in the procedure.

d. One deleted from the list of end item requirements all those items not necessary for this test.

e. Six revisions changed the program.

f. One called for the verification that the aft Bus 2 was off, and another called out an aft Bus 2 voltage reading of 0 $\pm$ 1 VDC, to ensure that it was off.

g. One deleted the paragraph concerned with time significant items, because there were none in this system.

h. One changed a reading because of insufficient time delay.

No failures were reported during this procedure.

4.2.3.3 Signal Conditioning Set Up (1B49547)

Test Explanation

This procedure provided instructions for the manual adjustment and calibration of the stage signal conditioning equipment. Equipment was to be calibrated if it was found out of tolerance during automatic checkout, or if a component replaced was found out of tolerance. In addition, this procedure was used to trouble shoot instrumentation during a computer hold, and to verify the operation of the transmitter switch assembly, two transducers, and the T/M calibration.

Test Review

The test began on 13 January 1966, and was accepted on 1 February 1966, after fifty-four revisions and six failure and rejection reports had been recorded. The revisions were noted in the revision log sheet as follows:

a. Nineteen added items to compensate for omissions from the procedure.
b. Eighteen revisions corrected minor errors in the procedure.
c. Eight were made to correct typographical errors.
d. Two changed an adjustment to enable monitoring of certain frequencies using existing test equipment.
e. A paragraph was added to ensure that the manual checkout decoder was off before disconnection from vehicle.
f. One changed the procedure because wiring of adapter cables was not compatible with vehicle and test equipment.
g. A revision made in error was voided.
h. One deleted a requirement because of scheduling.
i. One added a test to determine if a transducer shortage existed.
j. One deleted ambient temperature readings because simulators were used only to establish continuity.
k. One deleted voltage readings which were inaccurate.

The six FARR's written were as follows:

a. FARR A174435 noted that a wire in wire harness, P/N 1B52350-1C, S/N 8479, had insulation and strands cut. The cut wires were replaced.
b. FARR A174449 reported an open transducer, P/N 1B50733-1, S/N 56161. The transducer was returned to the vendor for replacement.
c. FARR A184708 noted that the R-17 potentiometer on low gain amplifier, P/N 1A94910-1Y, S/N 00021, could not be adjusted within tolerance.

4.2.3.3 (Continued)

d. FARR A184709 recorded that low gain amplifier, P/N 1A94910-503Y, S/N 00212, was out of tolerance on gain factors.

e. FARR A184710 noted that the R6 potentiometer on the temperature module could not be adjusted to 0 ± 0.005 VDC. The potentiometer was scrapped.

f. FARR A184711 noted that it was impossible to get correct output from module, P/N 1B39022-1, S/N 00001. The module was accepted after retest.

4.2.3.4 Digital Data Acquisition System (DDAS) Tests

The digital data acquisition system serves a dual purpose, having a prime function during ground checkout, and a secondary function during flight. The DDAS telemetry system, using PCM/FM/FM, operates in parallel with the three PAM/FM/FM systems. During ground checkout and trouble shooting, the DDAS is the prime data source for ground support monitoring and recording equipment. During flight, the DDAS serves as a backup for prime data channels, and includes a flight tape recorder to store PCM data for later playback on ground command.

Operation of the DDAS was verified by the following three tests:

a. DDAS calibration.

b. DDAS calibration, manual operation.

c. Digital data acquisition system.

4.2.3.4.1 Digital Data Acquisition System Calibration (1B55792)

Test Explanation

This procedure was used in conjunction with DDAS calibration, Manual Operations, and H&CO 1B44548. The D924A Computer was used to verify calibration of each data channel, from the input to the Model 270 multiplexers, through the PCM/DDAS assembly, to the output of the DDAS ground station.

Each of the four multiplexers was tested individually.

Test Review

This test began on 18 January 1966, and was certified on 24 January 1966. It was run twice. The first time, on 18 January 1966, the first three channels tested on the A3 multiplexer measured out-of-tolerance voltages. The test of this multiplexer was terminated at this point. Upon retest, the A3 multiplexer unit was

4.2.3.4.1 (Continued)

found to be operating properly. The test was run for the second time, on 20 January 1966, on the A3 unit only, and was completed successfully. The results were accepted on that date.

The revision documentation log sheet noted the following ten revisions:

a. Six corrected minor errors in the procedure.

b. One called out the installation of eleven jumper wires because certain transducers had not been installed at the time of the test.

c. Two deleted measurements which were not necessary for this test.

d. One widened certain voltage tolerances because the PCM/DDAS assembly, P/N 1A74049-513, S/N 00001, was defective and caused random channel malfunctions. This assembly was to be rejected following vehicle test at SSC.

The following FARR's were released against this procedure:

a. FARR A174437 noted that a 3.75 VDC input resulted in a 2.495 VDC output, instead of 3.75 + 0.025 VDC output, from multiplexer, P/N 1B55251-511, S/N 00002. The multiplexer was retested without recurrence of the problem, and was accepted.

b. FARR A174445 noted that a sawtooth output resulted when voltage was applied to multiplexer, P/N 1B55251-525, S/N 00002. A square wave output should have resulted. The multiplexer was acceptable as is.

c. FARR A184712 noted the defective PCM/DDAS assembly which had caused random channel failures. The assembly was accepted for testing purposes.

d. FARR A184714 noted that the switch on valve, P/N 1A49965-509, on LOX chilldown pump, P/N 1A49423-1, had continuity between pins E and F, rather than between pins D and E, when open. The switch was returned to the vendor for rework.

4.2.3.4.2 Digital Data Acquisition System Calibration, Manual Operation (1B44548)

Test Explanation

This procedure was used in conjunction with the DDAS Calibration, Automatic Procedure, H&CO 1B55792, providing the manual instructions necessary to check out the Model 270 multiplexers and the Model 301 PCM/DDAS assembly. The objective of this checkout was to verify calibration of all prime and submultiplexed data channels, from the input to the 270 multiplexers, through the PCM/DDAS assembly, to the output of the DDAS ground station.

4.2.3.4.2 (Continued)

Test Review

This test was started on 18 January 1966, and accepted on 21 January 1966. Nineteen revisions were made against the procedure, and recorded in the documentation log sheet as follows:

a. Five corrected errors in the procedure.
b. Two added items to the procedure.
c. Three deleted measurements because parts shortages, requiring the use of simulators, made in-tolerance readings impossible.
d. Four deleted items not necessary for this test. Included in these was a manual check of the SSB ground station, because the station was not to be used in this test.
e. One deleted a revision erroneously made.
f. One called for a jumper from the negative lead of the power supply to vehicle ground.
g. One added a data sheet to the procedure.
h. One changed safety requirements to specify that power supplies should not be connected or disconnected with power on.
i. One required that the A1 multiplexer internal clock, which was set at 3595 cps, be reset to 3400 ± 20 cps.

No failure reports were noted against this procedure.

4.2.3.4.3 Digital Data Acquisition System (1B55793)

Test Explanation

This test verified the operational status of those data channels on the stage which had not been checked out in previous system tests. Making use of the D924A computer to test the output from each channel, it determined whether or not the signal conditioning units, their associated amplifiers, the command calibration, channel decoders, the multiplexers, the DDAS assembly, and the central command calibration decoder were operating properly.

Test Review

This test was initiated on 25 January 1966, and final acceptance tock place on 7 February 1966. Seventy revisions were noted on the revision documentation log sheet, as follows:

4.2.3.4.3 (Continued)

a. Twenty-nine revisions were written to correct procedure and program errors, to delete or change other revisions made in error, or to add commands to the program.

b. Thirty-two revisions deleted measurements because either the out-of-tolerance measurements were not necessary for this test, there was no time available for trouble-shooting, adjustments had been made which were not reflected in the procedure, connections were loosely wired, or the PCM/DDAS assembly caused certain random channel failures. Other problems were parts shortages which required the use of simulators, channels which were recalibrated after testing, defective parts being used temporarily, design problems, and rework which had yet to be accomplished.

c. Six revisions changed test requirements because: heat curing in process would not permit in-tolerance ambient temperature measurements; the removal of fluid prevented in-tolerance measurements of liquid level in the auxiliary reservoir of the hydraulic system; and bench test data deviated from automatic results due to the slow rate of discharge of the multiplexers under no-load conditions.

d. Two revisions deleted the use of test equipment not required for this check-out.

e. One deleted a step from the procedure which was not necessary for this test.

No discrepancies were noted against this procedure.

4.2.3.5 Exploding Bridgewire System (1B55796)

Test Explanation

This procedure defined both the manual and automatic processes required to ensure the capability of the EBW system to initiate ullage rocket ignition and jettison, when so commanded by the instrument unit. Responses were monitored by the ACS and compared with specified requirements.

Test Review

This test was run twice on 22 January 1966. On the first run, the pulse sensor was found to malfunction. A failure and rejection report was written, and the pulse sensor was removed and replaced for the second run. The procedure was successfully completed on the second run. There were four revisions recorded on the revision documentation log sheet, as follows:

a. One changed required voltages because of loading caused by 100K resistors in the multiplexer.

b. One changed jettison voltage requirements to ensure that firing units were completely discharged.

4.2.3.5 (Continued)

c. Two added or deleted commands from the program.

The FARR mentioned above was FARR A174448, noting that the pulse sensor operated intermittently, and calling for its replacement.

4.2.3.6 Propellant Utilization System Tests

The purposes of the propellant utilization system are to control the fuel to oxidizer mixture ratio in such a way as to ensure simultaneous depletion of propellants, and to supply propellant level information for tank fill and topping operations.

Two test procedures were run to assure that the propellant utilization system was operational. They were:

a. Propellant utilization system calibration.
b. Propellant utilization system.

4.2.3.6.1 Propellent Utilization System Calibration (1B44549)

Test Explanation

This test verified the calibration of the propellant utilization system. The following items were checked:

a. Verification of static inverter/converter output voltages.
b. LH_2 and LOX empty and full calibration.
c. Data acquisition of the LH_2 and LOX bridge position.
d. LH_2 and LOX bridge slew checks (1/3 and 2/3 slew).
e. Reference Mixture Ratio (RMR) calibration.
f. LH_2 and LOX bridge linearity checks.
g. Verification of hardwire loading circuits.

Test Review

The test began on 17 January 1966, and was accepted on 20 January 1966. During the course of the test, a short circuit was discovered in a wire harness assembly, and corrected.

The following seven revisions were noted on the revision documentation log sheet:

4.2.3.6.1 (Continued)

a. Six corrected minor errors in the procedure.

b. One changed a tolerance because of drift of readings due to tank environmental conditions.

One discrepancy was noted, as follows:

a. FARR A174436 noted the short circuit in wire harness, P/N 1B56731-1, S/N 00001. Plug P6 was removed and replaced.

4.2.3.6.2 Propellant Utilization System (1B55797)

Test Explanation

The purpose of this test was to verify the capability of the propellant utilization system both to ensure simultaneous depletion of propellants, and to verify propellant level information for controlling the fill and topping valves during LOX and LH_2 loading.

Test Review

This test was run and accepted on 21 January 1966. The following eight revisions appeared on the revision documentation log sheet:

a. Four corrected minor errors in the procedure.

b. Two added minor items to the procedure.

c. Two changed tolerances as directed in NASA letter R-QUAL-P/DAC-#5-66/SCHARLACH.

No discrepancies were recorded against this procedure.

4.2.3.7 Level Sensor and Control Unit Calibration (1B44546)

Test Explanation

This procedure provided for the calibration of the liquid level and liquid/gas differentiator sensor systems, the LOX and LH_2 point sensor systems, and the LOX and LH_2 tank overfill and fast fill sensor systems. The test was designed to adjust the operating point of the point level sensor control units to a level well within the limits of the capacitance changes caused by a simulated wet condition RACS command.

4.2.3.7 (Continued)

Test Review

The test was begun on 12 January 1966, with acceptance taking place on 21 January 1966, after seventeen revisions and six failure and rejection reports had been written against it. The revisions, as reported on the revision documentation log sheet, were as follows:

a. Three corrected minor errors in the procedure.

b. One deleted a revision which had been erroneously made.

c. One deleted certain steps in order to reflect more accurately the method by which power is normally applied to the vehicle.

d. One renumbered certain steps because the only necessary command was level sensor power on. Another was then made to change certain sentences to reflect the change in step numbers.

e. One clarified a connector part number, and seven others changed sentences to include this clarification.

f. One changed a cable designation in a figure, and another was written to add to the figure a connection to vehicle ground, because the change in cables removed the ground return for a point in the test assembly.

The six FARR's mentioned above noted the following:

a. FARR A174433 noted that a relay in control unit, P/N 1A68710-511, S/N E-58, activated at random and would not deactivate to a 0 $\pm$ 1.1 VDC reading when capacitance was decreased. It was found that the potentiometer was inaccurately adjusted; the relay was retested without incident and accepted.

b. FARR A174438 reported that a connector pin in wire harness, P/N 1B56380-1, was recessed, and the metal shielding was bent. The pin was removed and replaced, and the connector accepted.

c. FARR A174439 noted that control unit, P/N 1A68710-509, S/N E-86, had an erratic output response to a 5 VDC input. The unit was accepted following retest.

d. FARR A174442 recorded a short from conductor to shield of a wire in wire harness, P/N 1B44906-1NC, S/N 00001. The harness was accepted after a plug had been replaced.

e. FARR A174444 noted that the output from control unit, P/N 1A68710-509, S/N E-105, remained at 0.0 VDC when input changed. The unit was reworked to B/P, and accepted.

f. FARR A174446 noted a dead short on an inner contact wire and shield in wire harness, P/N 1B50197-1A, S/N 00001, and a crack on the edge of the coaxial outer contact barrel of the same assembly. A pin was replaced to correct the short, and the defective barrel was removed and replaced.

4.2.3.8 Cryogenic Temperature Sensor Verification (1B44544)

Test Explanation

The purpose of this test was to check out each temperature transducer whose normal operating range did not include ambient temperature.

Test Review

This test was started on 14 January 1966. Acceptance of the data obtained took place on 27 January 1966. There were five revisions to the procedure recorded on the revision documentation log sheet:

a. One added items which had been omitted from the procedure.
b. One deleted a requirement that serial numbers of certain sensors be verified, because the S/N's were impossible to read and were already listed in the vehicle serialization log book.
c. One corrected a typographical error.
d. One added a seven per cent tolerance on certain temperature measurements because of the effects of ambient temperature on the readings.
e. One noted sensors which were not tested, because they were not installed during the test.

No failure reports were written against this test.

4.2.3.9 Telemetry and Range Safety Antenna System Check (1B44545)

Test Explanation

This test was conducted to verify that the telemetry and range safety antenna systems were operational.

Test Review

The test began on 21 January 1966, and acceptance occurred on 31 January 1966. The revision documentation log sheet noted the following thirty-eight revisions to the procedure:

a. Sixteen corrected minor errors in the procedure.
b. Three added or changed designation numbers of parts called out in the procedure.
c. Two provided that the orbit transmitter be turned off during RF power detector calibration, because power was required at one level only.
d. Two added or changed commands to the SSB transmitter group.
e. Four revised tables and figures as required due to revisions in the procedure.

4.2.3.9 (Continued)

f. Two deleted paragraphs from the procedure because they were not necessary for this test.

g. Two changed the procedure to permit proper setup of reflected power detectors.

h. Three deleted measurements because parts shortages resulted in inaccurate readings.

i. Three changed tolerances to allow for cable insertion losses and greater sensitivity requirements.

j. One added a test cable required for R/S insertion loss measurements.

There were no discrepancies recorded during this test.

4.2.3.10 Electromagnetic Compatibility Check (1B64955)

Test Explanation

This test was designed to determine stage power system electromagnetic interference characteristics. The procedure described the setup and operation of EMC test equipment, to be used in parallel with the following checks:

a. EBW System (Auto).

b. Hydraulic System (Auto).

c. All Systems (Umbilicals in).

Test Review

The test was conducted beginning on 20 January 1966, with certification taking place on 3 February 1966. Five revisions were noted in the revision documentation log sheet, as follows:

a. Two deleted requirements because of a time shortage.

b. One enabled the hookup of the test cables prior to the power distribution test.

c. One added three tests to be run in parallel with this one, at NASA request.

d. One added a report number to specify a document in which test results were to be indicated.

No failures were recorded during the course of this test.

4.2.4 Engine Alignment Procedure (1B39124A)

Test Explanation

This procedure provided instructions for aligning the J-2 engine with the stage, while in a vertical attitude.

4.2.4 (Continued)

Test Review

This test began on 19 January 1966, and was successfully completed on 25 January 1966. There were three revisions made to the procedure, as noted on the revision documentation log sheet:

a. One added a paragraph to change the procedure for determining the angle of inclination, in the event that the distance between "G" planes was excessive.

b. One deleted the use of a locking fixture and substituted standard hand torque tools, because the fixture would not work.

c. One specified that only "C" clamps would be used to install the clinometers, because the lock also called out in the procedure was not operational.

The alignment procedure was run with no discrepancies recorded.

4.2.5 Auxiliary Propulsion System (1B55800)

Test Explanation

The purpose of this procedure was to verify the integrity of the stage portion of the APS system, using simulators in the absence of the APS modules. The following specific tests were performed:

a. Verify that bus power can be applied, and that static loads are not excessive.

b. Verify that attitude control commands from the I.U. control the proper sets of quadredundant solenoids (simulated).

c. Verify the telemetry system measurements associated with the APS by observing each active parameter on the stage, and each simulated transducer output.

Test Review

The test was run twice on 21 January 1966, and final acceptance took place on 24 January 1966. During the first run, a simulator was found to be miswired, and two bridge modules were found to be of the wrong configuration. On the second run the test was completed satisfactorily. Seven revisions appeared on the revision documentation log sheet; six corrected minor errors in the procedure, and one changed the procedure in several places as called out on NASA document R-QUAL-P/DAC.

No failure and rejection reports were written as a result of this test.

4.2.6 Hydraulic System (1B55801)

Test Explanation

This procedure verified the integrity and operational capability of the hydraulic system.

The following tests were performed:

a. Calculation of accumulator GN_2 mass.
b. Reservoir oil level and pressure test (unpressurized).
c. Auxiliary pump motor thermal switch test.
d. System supply and accumulator GN_2 pressure test.
e. Reservoir oil level and pressure test (pressurized).
f. Actuator polarity and engine clearance test.
g. Servo actuator frequency response test.
h. Engine centering test.

Test Review

The test was run on 29 January 1966, and certified on 11 February 1966. The following twenty revisions were incorporated in the revision documentation log sheet:

a. Four changed steps to conform to existing test and system equipment, and to incorporate latest design changes.
b. Three deleted steps because they were not necessary, or because of parts or time shortages.
c. Eight corrected errors in the program, or changed the program to conform to design changes.
d. Two revisions set new breakpoints to make it possible to determine if pitch and yaw power came on.
e. Two added paragraphs; one to note that the gimbal was a cycle-significant item, and one to reflect new test requirements.
f. One changed a measurement because of a missing jumper wire.

No discrepancies were recorded against this procedure.

4.2.7 Systems Tests Not Accomplished

The following tests, originally intended for performance on the stage, either were never activated or were cancelled, due to scheduling limitations and parts shortages. Equivalent tests were to be integrated into the Sacramento test schedule, and performed during stage testing at STC.

4.2.7 (Continued)

In general, these tests comprised some electrical/electronic system checkouts, some propulsion system checkouts, and the final all-systems checkouts. By general systems breakdown, the tests not accomplished were:

Electrical/Electronic Systems

a. Telemetry System, Manual Operation, H&CO 1B44552.
b. Telemetry System, Automatic Checkout, H&CO 1B55799.
c. Single Sideband System, Manual Operation, H&CO 1B58467.
d. Single Sideband System, Automatic Checkout, H&CO 1B55794.
e. Range Safety System, Automatic Checkout, H&CO 1B55798.
f. Range Safety Receiver, Automatic Checkout, H&CO 1B55798.
g. Range Safety Receiver, Manual Operations, H&CO 1B44550.

Propulsion System

a. Pneumatic Control System Leak Check, H&CO 1B57385.
b. Pneumatic Control System, H&CO 1B55802.
c. Cold Helium System Leak Check, H&CO 1B57388.
d. Cold Helium System, H&CO 1B55803.
e. Fuel Tank Pressurization System Leak Check, H&CO 1B57387.
f. Fuel Tank Pressurization System, H&CO 1B55804.
g. Propellant Tanks System Leak Check, H&CO 1B57389.
h. J-2 Engine Leak Check, H&CO 1B57390.
i. J-2 Engine System, H&CO 1B55805.
j. Repressurization System Leak Check, H&CO 1B57391.
k. Repressurization System, H&CO 1B56281.

All System Tests

a. All Systems Tests, H&CO 1B55809.

The aft skirt and interstage thermo-conditioning and purge system check, H&CO 1B40550, and the hydraulic system fill and bleed procedure, H&CO 1B62519, were transferred open to STC.

4.3 Stage Manufacturing Tests

All manufacturing inspection and test records for the stage are reviewed and presented in this section. Table II is the narrated form of the permanent nonconformances recorded on FARR's during manufacturing inspection and test. The dispositioning

4.3 (Continued)

of these FARR's was accomplished by the Material Review Board. The FARR system is used to report discrepancies throughout receiving inspection, manufacturing assembly, testing, and installation. A review has been made of acceptance test data pertaining to the weight, balance, and shipment requirements, hydrostatic proof test, and subsequent leak test of the propellant tanks.

4.3.1 Stage Preparation for Shipment

Four procedures were conducted to prepare the stage for shipment by transporter to the Seal Beach dockyard, and by barge from there to Sacramento. These procedures were:

a. Environmental protective cover kit-assembly, installation, and removal.
b. Transportation instrumentation systems.
c. Preparation of the stage for the weigh and balance procedure.
d. Weigh and balance procedure.

4.3.1.1 Protective Cover Kit, Environmental (1A57862)

This document outlined the procedures for assembling, installing, and removing the stage protective cover kit, P/N 1A57861-1. The cover protected the stage against rain and dust surface transportation between SSC and STC.

The procedure was conducted between 7 and 10 March 1966. No functional failures were noted, and no revisions were written to the procedure.

4.3.1.2 Transportation Instrumentation System (1B39698)

This procedure specified the handling and checkout operations for the transportation instrumentation kit, Model DSV-4B-175, in conjunction with the NASA furnished mobile instrumentation system trailer and power supply trailer. The transportation instrumentation system was used to monitor the stage during all highway and water transportation operation. Also included were specific checkout and setup steps for proper operation of the system, installation and removal instructions, and return shipment instructions for the Model 175 after removal from the stage.

The following major functions were accomplished by this procedure:

a. Check for proper function of:

4.3.1.2 (Continued)

1. Sixteen vibration accelerometers.
2. Two temperature and two humidity sensors, one each mounted forward and aft.
3. Two differential pressure sensors.
4. One pitch and one roll sensor, mounted on the deck of the ship during water transportation.

b. Check and setup of:

1. Regulated power supply control panel.
2. Air conditioning control system.
3. Instrumentation power supply.
4. Digital voltmeter.
5. Signal conditioning module.
6. Wideband signal amplifier units.
7. Automonitor units.
8. Recorder control unit.
9. Recording oscillograph.
10. Electronic duplex recorder.
11. Magnetic tape recorder.

Failure record sheets were kept during transportation, and remained in the trailer at the end of the trip for subsequent return to MSFC.

Test record sheets in the appendix of the procedure were used to record data on system failures or fixes. A table for equipment setup was also kept for recording all setup and calibration data. Reproducible copies were given to inspection upon completion of the trip.

There were no recorded functional failures noted, but three revisions to the procedure were made, to revise frequency tolerances. Testing was completed at GSC on 10 March 1966.

4.3.1.3 Preparation for Horizontal Weigh and Balance (1B37831C)

This procedure specified steps necessary to prepare the stage for the weigh and balance operation, and to load the stage on its transporter. Included were the following:

a. Installation of stage handling rings.
b. Preparation of weighing area in VCL.

4.3.1.3 (Continued)

c. Installation of stage and handling rings on cradles.

d. Installation, checkout, and removal (after weighing operation) of weighing equipment.

e. Installation of engine protective cover.

f. Installation of stage, with rings and cradles, on the transporter.

One revision to the procedure added a paragraph calling for shims to position retainer blocks, P/N 1B32367-1, and giving instructions regarding clamp bolts on the forward and aft cradles. There were no functional failures noted during the test periods of 4 to 5 March 1966.

4.3.1.4 Weigh and Balance, SSC (1B62978)

This procedure was used to measure the weight of the stage in such a manner that the longitudinal center of gravity could be calculated from the results. The predicted weight and the weight calculated from the measurements were within 0.1 per cent of one another.

The stage weight in air was measured at 24,479.1 pounds, and the weight corrected for Standard Locality in vacuum was 24,543.5 pounds. The horizontal center of gravity was found to be at station 322.9.

Ten revisions were written to the procedure, and recorded in the revision documentation log sheet as follows:

a. One added figures to the procedure.

b. Five added paragraphs and data to the procedure.

c. Two deleted data from the procedure.

d. Two revised paragraphs.

No functional failures were noted during the weigh and balance procedure, which was run on 5 March 1966.

4.3.2 Preshipment Purge, GN_2, Tanks and Propellant Lines (1B65050)

This procedure contained instructions necessary to purge and dry the stage witn GN_2 to a dryness of 15° F dewpoint (2700 ppm), or lower, prior to shipment to STC. Also included were instructions for attaching interim containers to the propellant tanks to maintain a dry environment during surface transportation.

4.3.2 (Continued)

There were twenty revisions noted on the revision documentation log sheet, as follows:

a. Eight deleted entire paragraphs.
b. One reidentified a paragraph.
c. Two added notes to the procedure.
d. One revised a pressure setting because the condition varied during purge.
e. Four revised paragraphs.
f. Four allowed substitutions for parts not available.

No discrepancies were noted during the test period of 6 to 8 March 1966.

4.3.3 Final Inspection

A final inspection of all mechanical and electrical areas was performed before the stage was weighed and prepared for shipment. There were 387 discrepancies noted during final inspection, of which 133 were of a mechanical nature, and 254 were electrical. The mechanical discrepancies were minor deviations as follows: loose hardware, missing or wrong parts, parts not identified, short or recessed bolts, damaged or bent parts, extraneous materials, scratched paint, parts not secured, areas requiring cleanup, etc. The electrical problems, also minor, were: chaffing and torn insulation, torn wrapping, wire harnesses loose or tight in clamps, riding the structure, too tight, or too slack, plugs not capped, wire harnesses not served per DPS, improper stowing, misidentified parts, damaged grommets, etc. All problems were resolved, and rework was completed, except for five discrepancies. FARR's A159448, A159450, and A188675 dealt with damaged wires or grommets on wire harnesses. The damaged wires were wrapped with teflon tape, and the grommets were replaced or relocated. FARR A184727 noted a broken bonding strap which was trimmed past the break. FARR A188673 noted mislocated support assemblies which were relocated.

4.3.4 Propellant Tank Leak and Hydrostatic Proof Tests

Two tests were performed on the propellant tank assembly after the assembly was completed and before the insulation was installed. A hydrostatic proof pressure test was conducted to verify the structural integrity of the propellant tank, and then a leak test was performed after a cleaning and degreasing operation. These two tests were conducted on stage 501 as detailed in the following paragraphs.

4.3.4.1 Hydrostatic Proof Test (1B38414)

Some of the objectives of the hydrostatic proof test were:

a. Test welds and bolts at the joint between the common bulkhead and the aft dome.

b. Proof the common dome to a positive internal pressure differential of 32.6 ± 0.5 psi.

c. Proof the common dome to a negative external pressure differential of 23.4 ± 0.5 psi.

d. Proof the aft LOX tank dome to a positive internal pressure differential of 51.6 ± 0.5 psi.

e. Proof the LH_2 tank cylindrical section, the LH_2 portion of the aft dome, and the forward dome, to a positive internal pressure differential of 38.8 ± 0.5 psi.

f. Test the joints of the LOX and LH_2 tanks for leaks.

The test was started on 8 April 1966, using production test plan A659-1B38414-1 PDS2, and completed and accepted on 9 April 1966. There were no functional discrepancies discovered, however, seven revisions were written on the documentation log sheet; three accepting a panel light indication of "test", which should have indicated "low", three allowing minor changes in procedural steps, and one changing an indicator because it would not go from "test" to "low".

4.3.4.2 Leak Check

The propellant tank leak checks were conducted to verify the integrity of the tank components and welds. Direction and results of these tests were recorded on Quality Engineering Charts (QEC) which are included in the stage log book.

QEC papers 751, 753, 754, 755, 756, 757, 758, 759, 760, 761, 794, 932, 1520, 1521, 1522, 1523, 1524, 1537, 1553, 1554, 1555, 1556, 1557, and 1558 were used for this test. One leak was discovered and corrected. No failure and rejection reports were written against these tests.

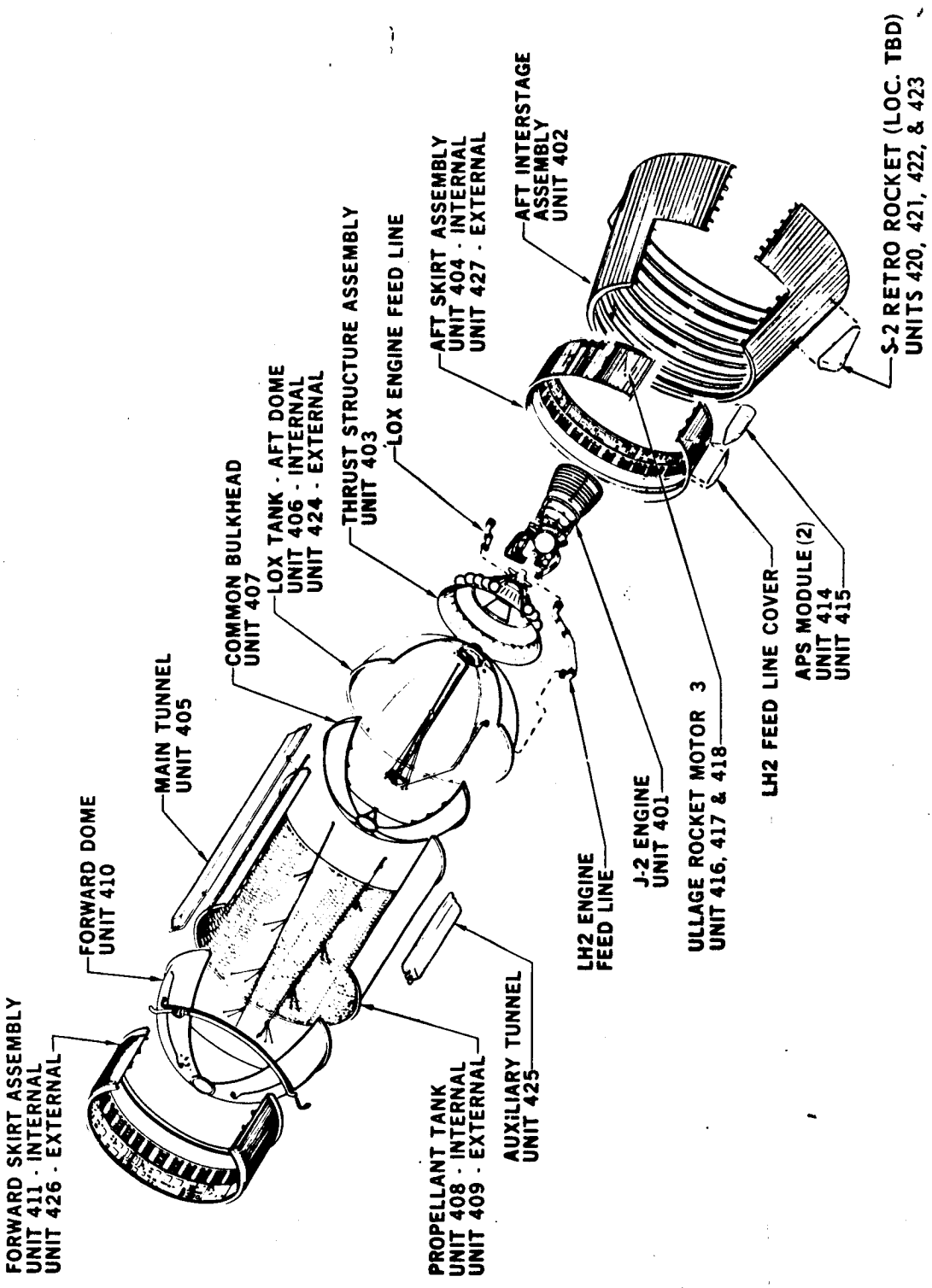


Figure 1. Exploded View of Stage, Showing Major Assemblies and Area Codes

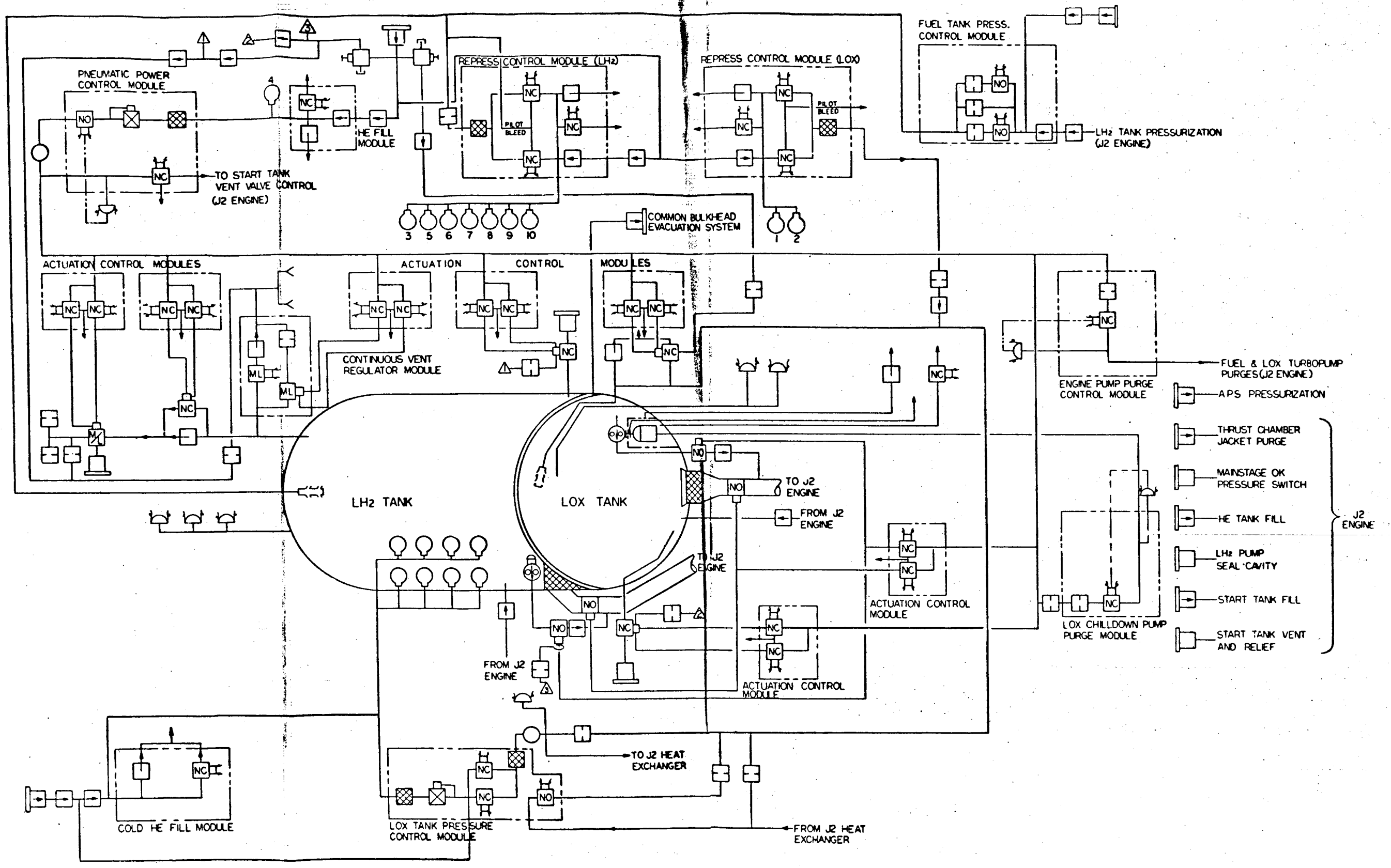


Figure 2. Propulsion ystem Schematic

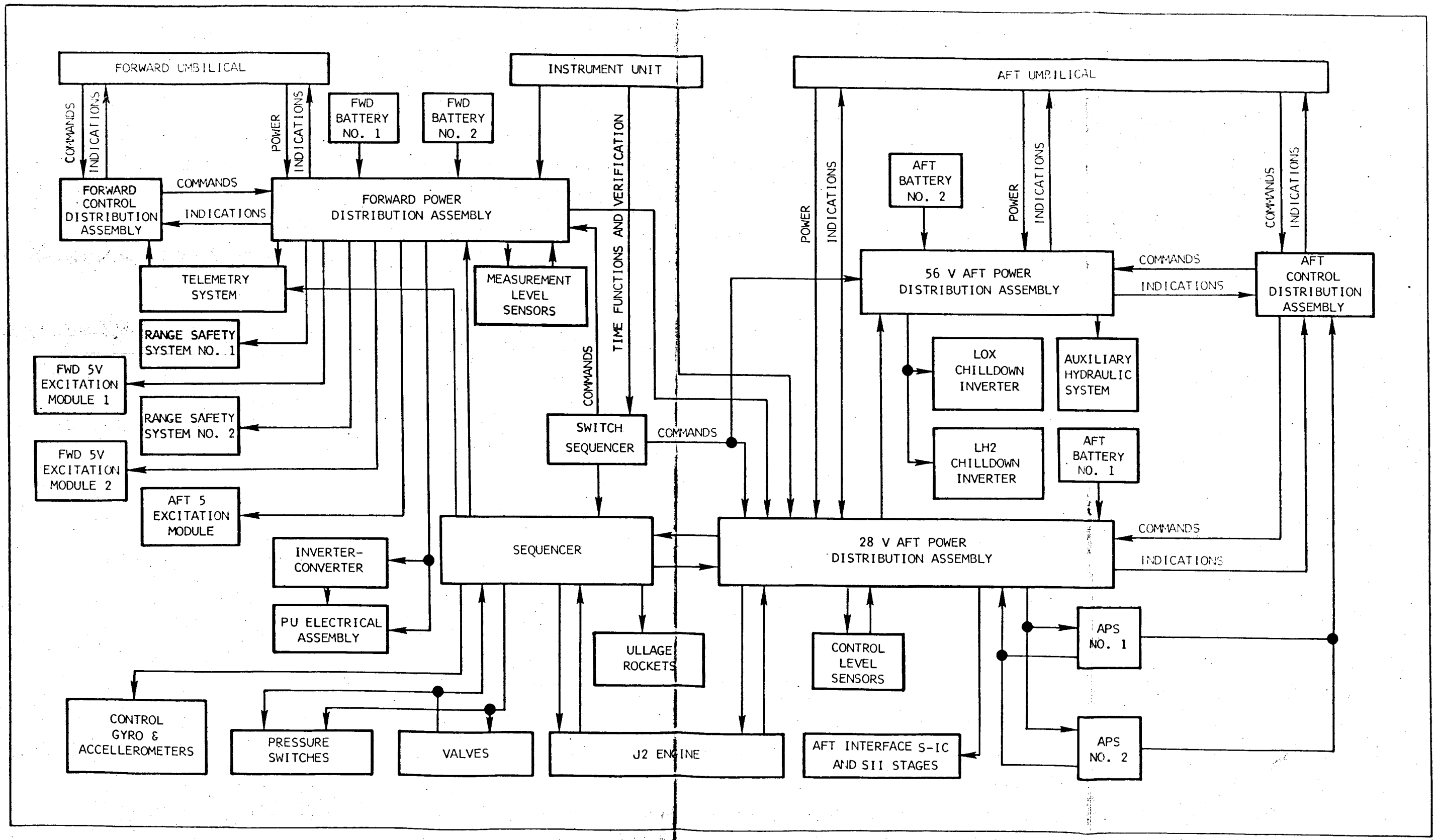


Figure 3. Electrical Control System

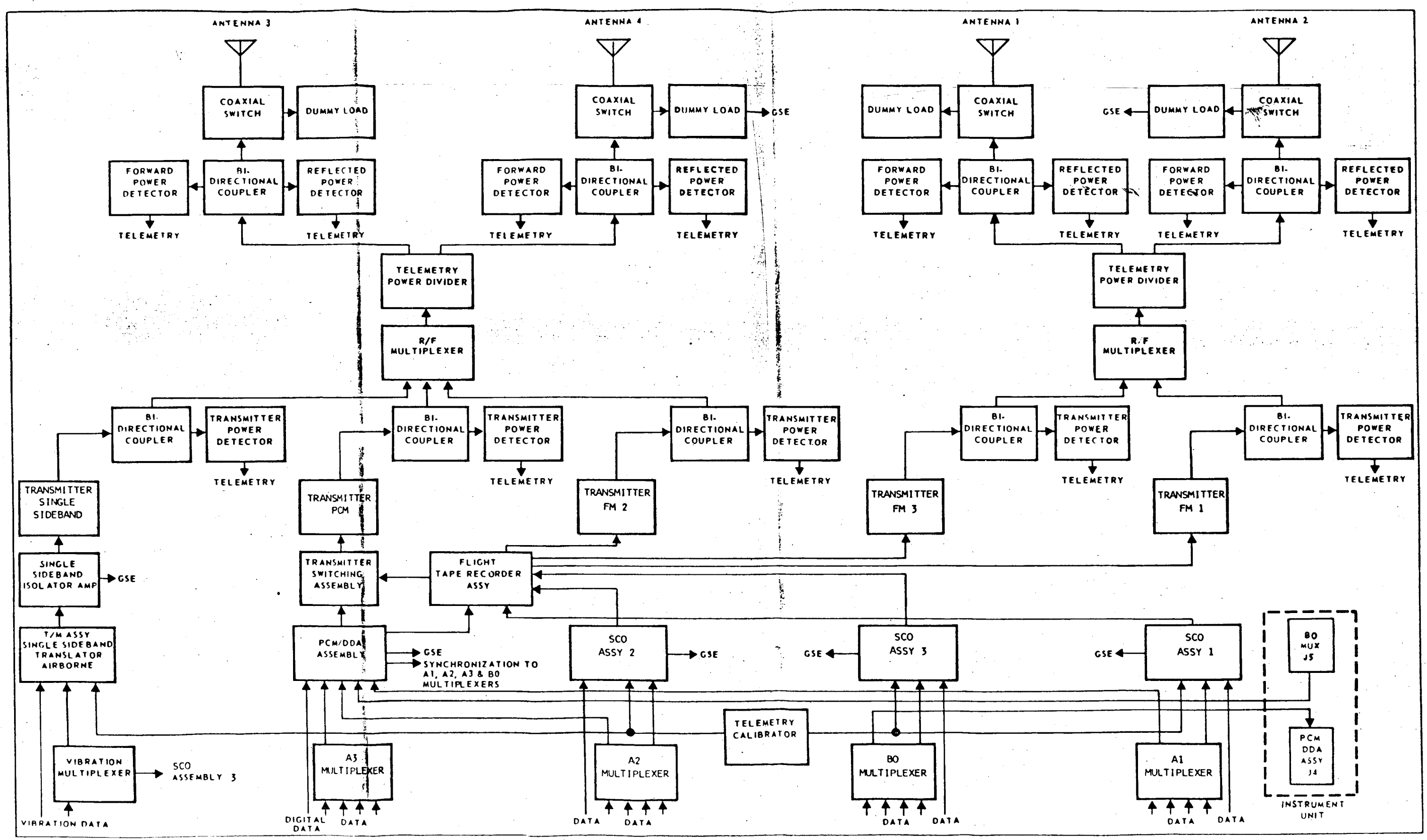


Figure 4. Telemetry System

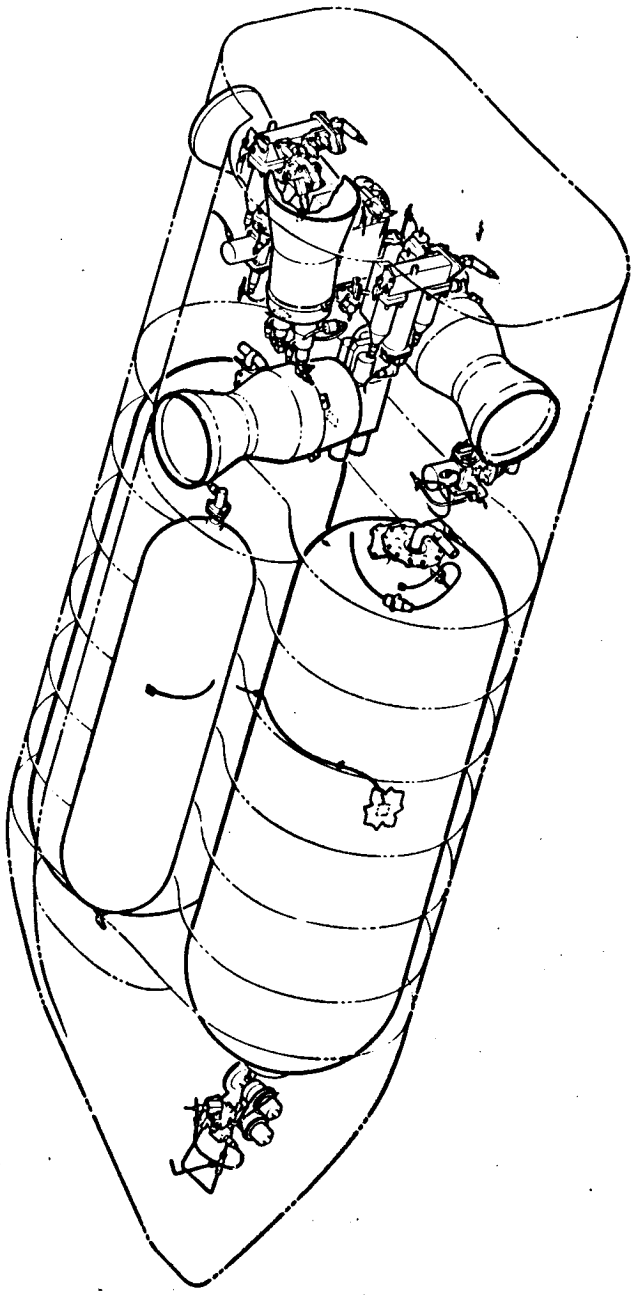


Figure 5. Auxiliary Propulsion Module

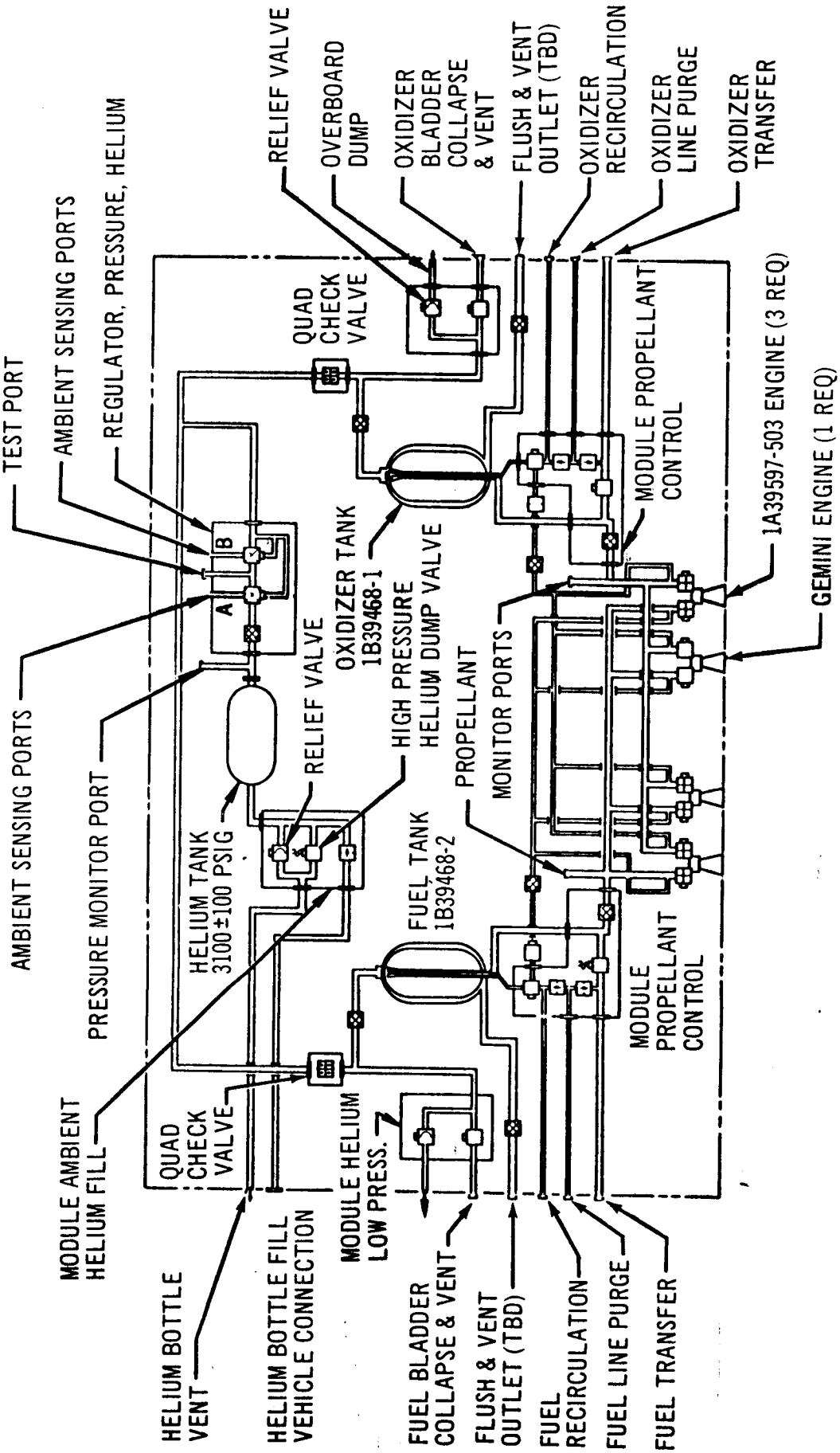
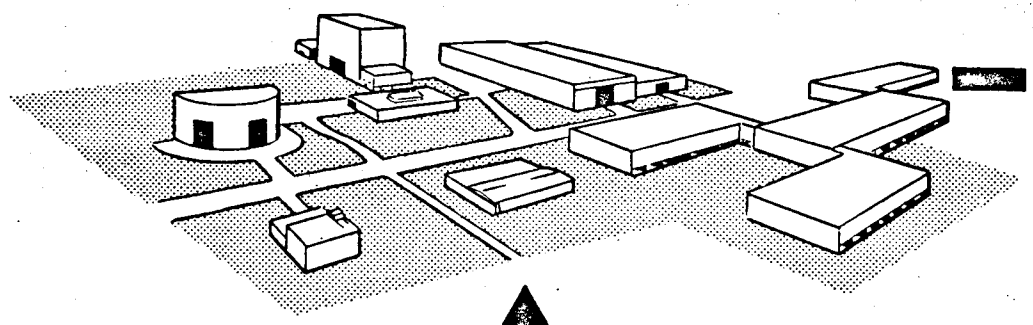


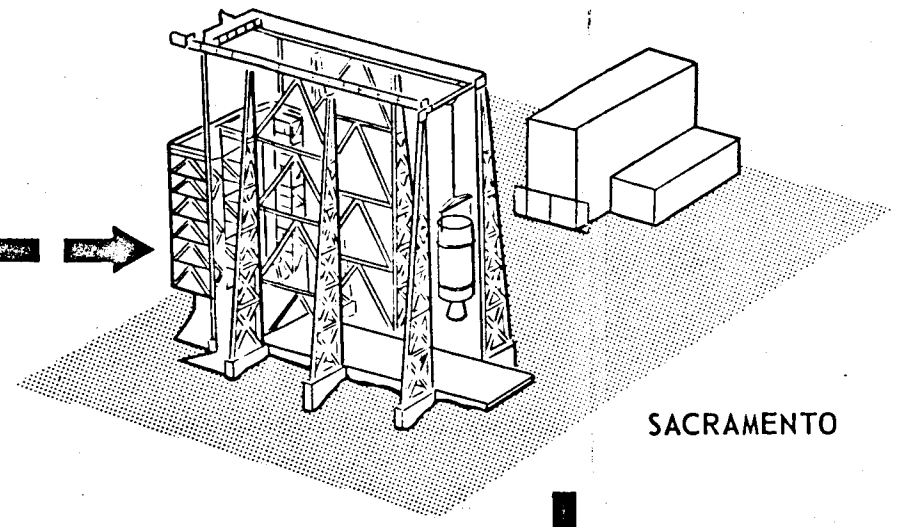
Figure 6. APS Module Schematic

HUNTINGTON BEACH
COMPLETE ASSEMBLY OF
STAGE, SYSTEMS CHECKOUT
PROGRAM MANAGEMENT



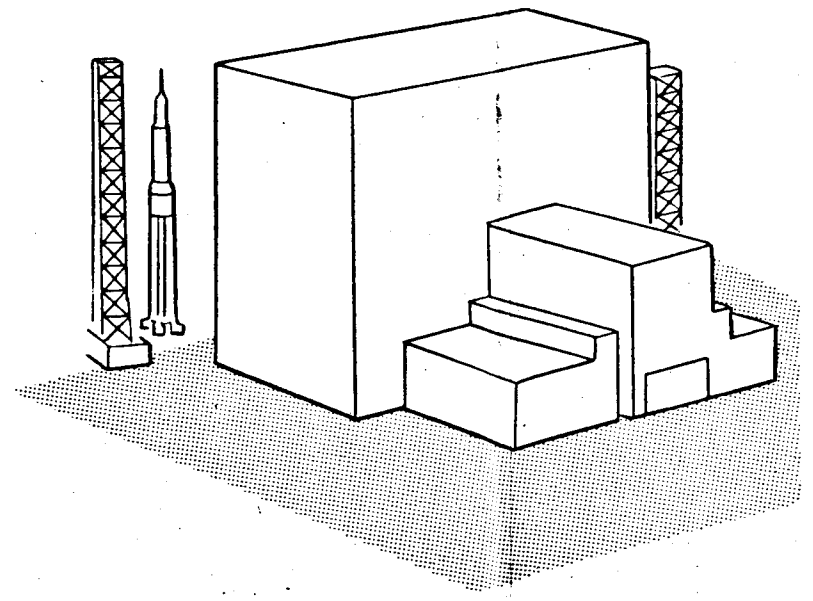
HUNTINGTON BEACH

SACRAMENTO
SYSTEMS CHECKOUT,
MODIFICATION, ACCEPTANCE
FIRE, PRE-FLIGHT TEST

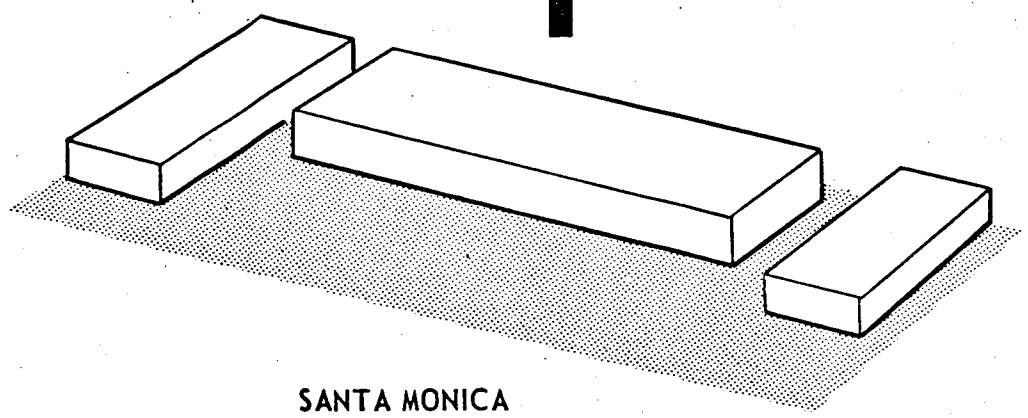


SACRAMENTO

KENNEDY SPACE CENTER
INSPECTION, MODIFICATION, MATING,
PRE-LAUNCH ACTIVITY, INTERFACE
RESOLUTION



KENNEDY SPACE CENTER



SANTA MONICA

SANTA MONICA
FABRICATION, ASSEMBLY
OF DOMES, COMPONENT
MANUFACTURE AND TEST

Figure 7. S-V Stage 501 Flow Plan

DEFECT CHARTS

The following charts represent plots of the weld and non-weld defects reported on Failure and Rejection Reports. The rejection reports used for the plotting appear in tabular form in Table II.

To aid in understanding the charts, an example is given.

Chart 2		Cylindrical Tank.
Item Number	102	Sequence Number in Table II.
FARR Number	A113986	Is the serial number of the Failure and Rejection Report.
Date	11-11-64	The report was initiated on 11 Novermber 1964.
Total Defects	1	One defect was reported on this Rejection Report.
Type of Defect	3	Per the Defect Code: The defect was linear porosity.
Detected by	X	Per the Inspector Code: The defect was detected by X-ray.
Side	--	In this position, whether the defect occurred on the inside or outside of this assembly would be designated. In this case it was undetermined.
Reworks Required	0	Accepted for use.

Defect Code

Weld Defects

1. Cracks
2. Lack of fusion or penetration
3. Linear porosity
4. Scattered porosity
5. Undercut
6. Underfill
7. Transverse and Longitudinal cold shuts
8. Porosity or voids with sharp tails
9. Arc strike
10. Crater
11. Suckback
12. Inclusions
13. Void, porosity
14. Backside shrinkage
15. Concavity
16. Weld overlap
17. Separation

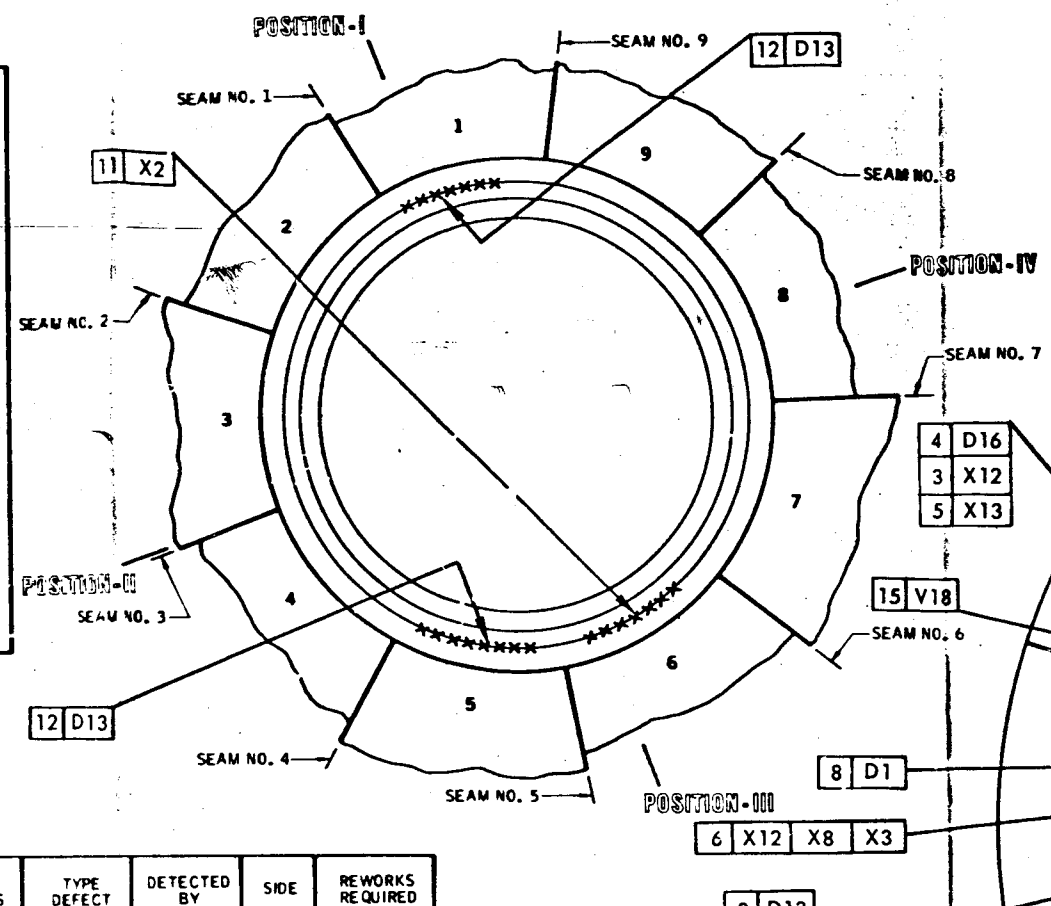
Inspection Code

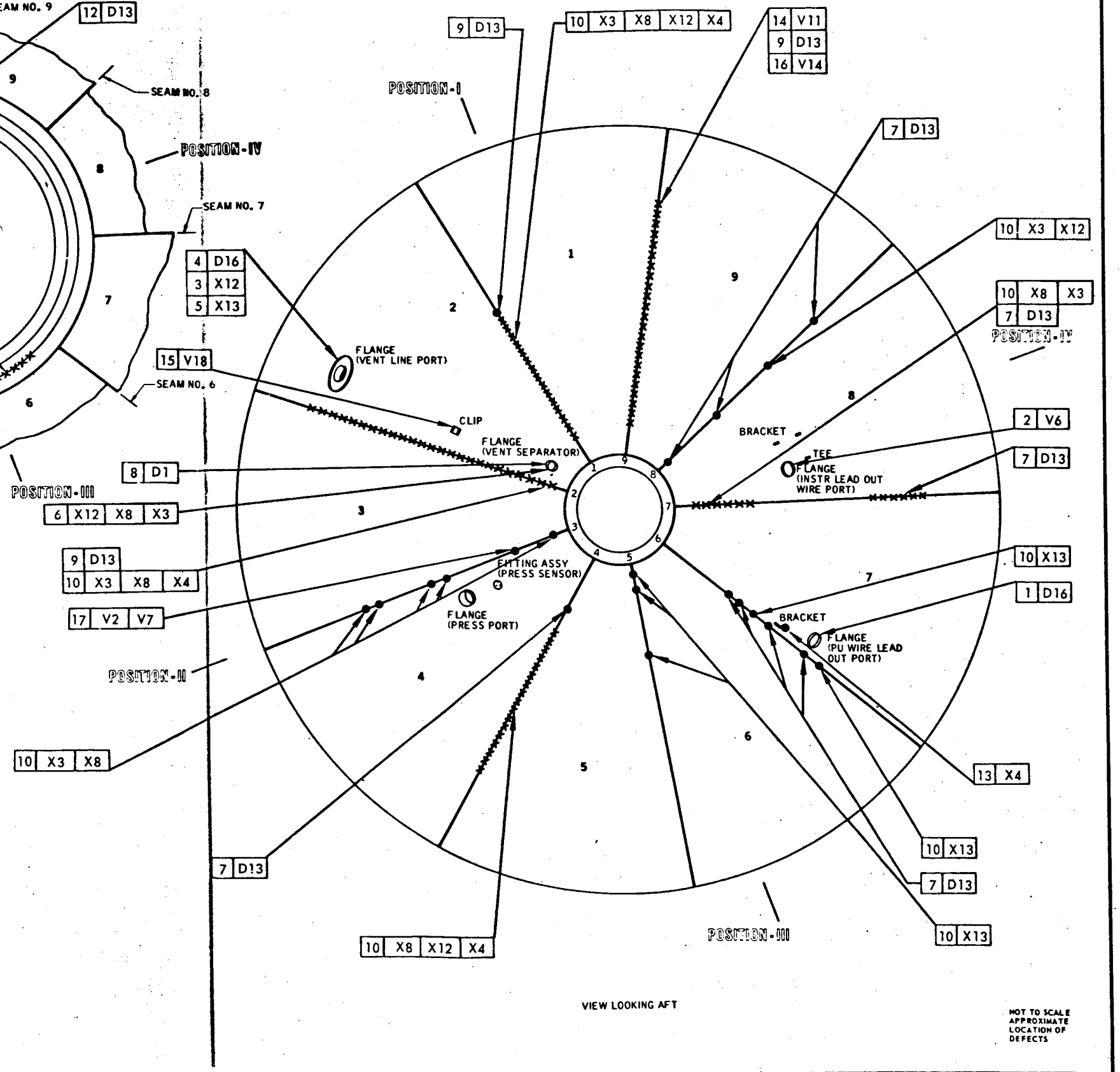
I - Inside
X - X-Ray
O - Outside
D - Dye Check
V - Visual

FORWARD DOME 1005

PART NUMBER 1A39304-503

SEGMENT 1 S/N	97
SEGMENT 2 S/N	87
SEGMENT 3 S/N	82
SEGMENT 4 S/N	81
SEGMENT 5 S/N	80
SEGMENT 6 S/N	83
SEGMENT 7 S/N	90
SEGMENT 8 S/N	88
SEGMENT 9 S/N	84

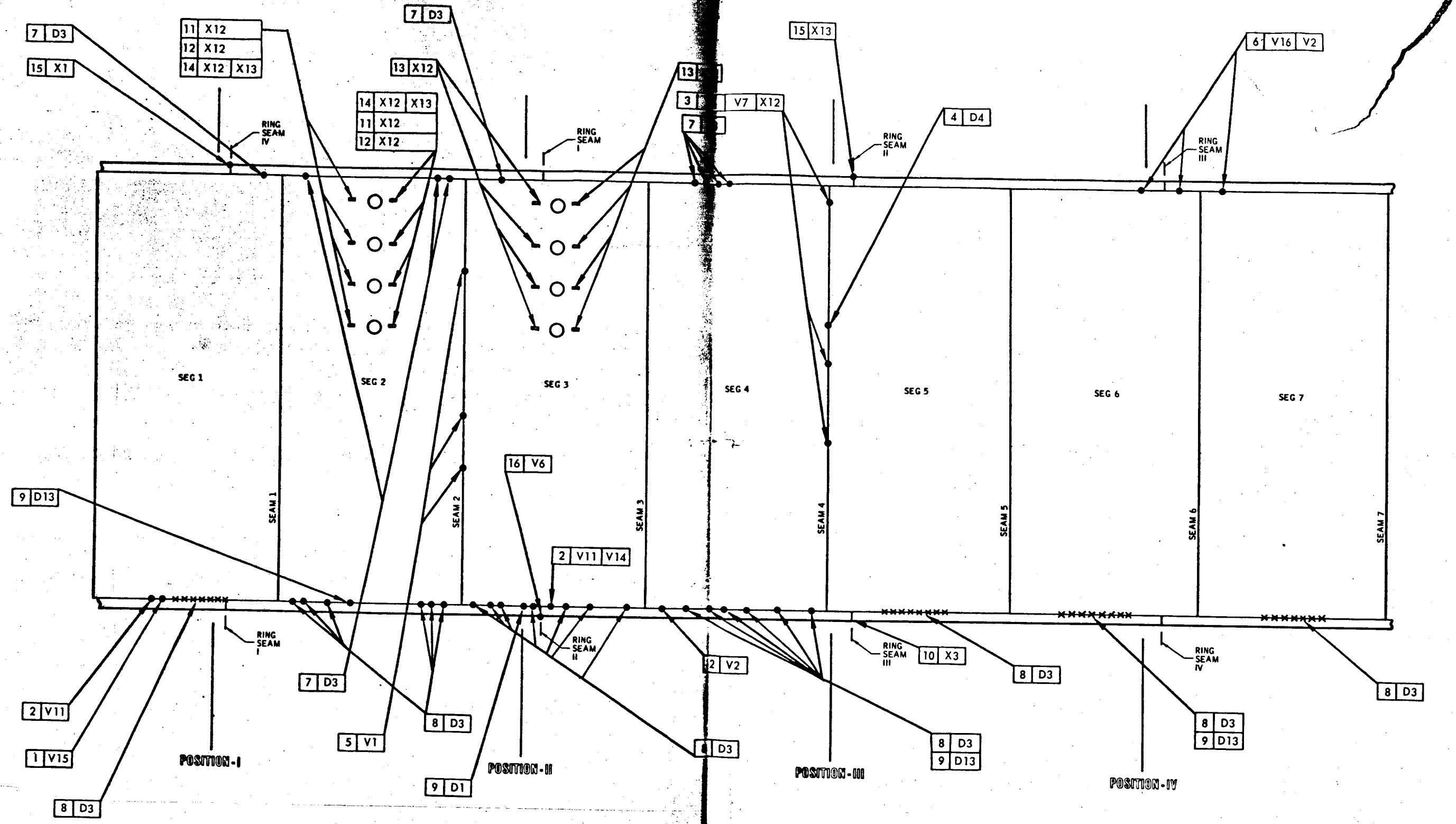




LEGEND

	TABLE II ITEM	FARR NUMBER	DATE	TOTAL DEFECTS	TYPE DEFECT	DETECTED BY	SIDE	REWORKS REQUIRED
1	59	A120071	12-17-64	1	16	D	O	1
2	60	A120090	12-16-64	1	6	V	O	1
3	61	A123105	1-7-65	1	12	X	O	1
4	62	A123107	1-8-65	1	16	D	–	1
5	63	A123108	1-8-65	1	13	X	I	1
6	64	A123109	1-8-65	3	12, 8, 3	X	I	2
7	65	A123114	1-14-65	NUMEROUS	13	D	I-O	2
8	66	A123117	1-16-65	1	1	D	I	1
9	67	A123119	1-20-65	NUMEROUS	13	D	I-O	2
10	68	A123124	1-23-65	NUMEROUS	3,8,1,2,4	X	–	3
11	70	A123139	2-14-65	1	2	X	–	1
12	71	A123140	2-16-65	2	13	D	I	3
13	72	A123149	2-23-65	1	4	X	–	0
14	73	A123155	1-5-65	NUMEROUS	11	V	O	1
15	75	A126901	1-15-66	1	18	V	I	1
16	78	A126904	1-19-65	1	14	V	I	1
17	79	A126911	1-31-65	2	2, 7	V	–	1
18								
19								
20								

Chart 1. Forward Dome Assembly



FWD RING S/N 00002
AFT RING S/N 00002
CYLINDRICAL TANK S/N 1005
PART NUMBER 1A39306-505
SEGMENT 1 S/N 0079
SEGMENT 2 S/N 0077
SEGMENT 3 S/N 0072
SEGMENT 4 S/N 0070
SEGMENT 5 S/N 0085
SEGMENT 6 S/N 0071
SEGMENT 7 S/N 0081

LEGEND

	TABLE II ITEM	FARR NUMBER	DATE	TOTAL DEFECTS	TYPE DEFECT	DETECTED BY	SIDE	REWORKS REQUIRED
1	89	A074456	2-25-65	1	15	V	–	0
2	90	A074460	2-14-65	3	14, 11, 2	V	–	1
3	92	A074558	1-20-65	3	5, 2	V-X	–	3
4	93	A074562	1-25-65	1	4	D	–	1
5	95	A074588	1-28-65	3	1	V	I-O	2
6	96	A074712	2-16-65	3	16, 2	V	–	1
7	97	A074716	2-18-65	NUMEROUS	3	D	–	1
8	98	A074810	2-20-65	NUMEROUS	3	D	–	1
9	101	A074813	2-22-65	4	13, 1	D	O	1
10	102	A113986	11-11-64	1	3	X	–	0
11	103	A114000	11-21-64	8	12	X	I	0
12	104	A118275	11-25-64	8	12	X	O	1
13	105	A120053	11-27-64	8	12	X	I	0
14	107	A120058	12-1-64		12, 13	X	–	0
15	108	A120072	12-18-64	2	1, 13	X	–	2
16	110	A120094	12-17-64	1	6	V	O	1

Chart 2. Cylindrical Tank Assembly

LO_2 TANK ASSY S/N 1005
COMMON BULKHEAD S/N 1005
AFT DOME S/N 1005
PART NUMBER 1A39307-505

LEGEND

	TABLE II ITEM	FARR NUMBER	DATE	TOTAL DEFECTS	TYPE DEFECT	DETECTED BY	SIDE	REWORKS REQUIRED
1	113	A123123	1-22-65					
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

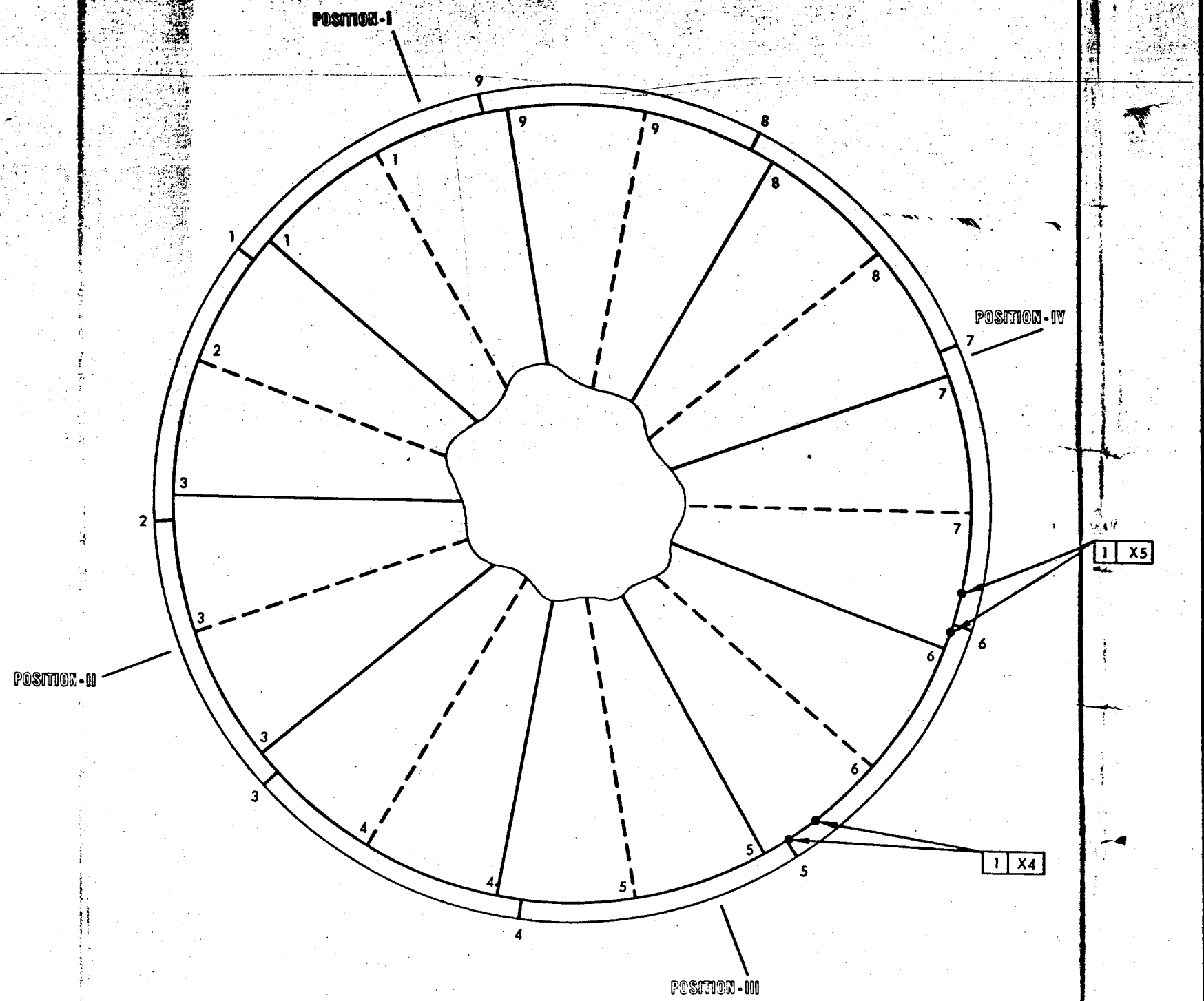
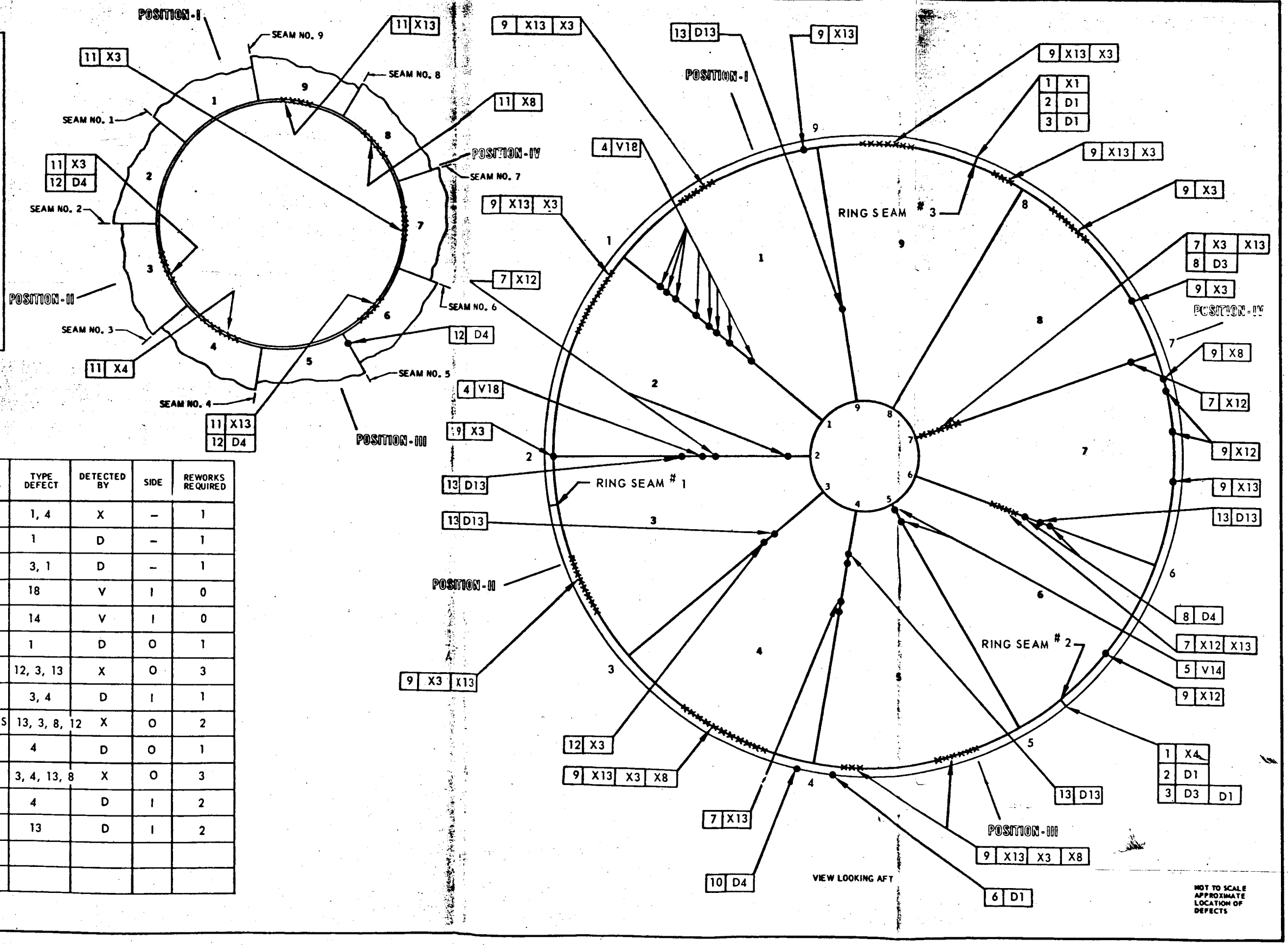


Chart 3. LOX Tank Assembly

DOME S/N 00009
RING ASSEM. S/N 00009
FORWARD FACE 1005
PART NUMBER 1A39280-501 C/L

SEGMENT 1	S/N	101
SEGMENT 2	S/N	98
SEGMENT 3	S/N	102
SEGMENT 4	S/N	104
SEGMENT 5	S/N	100
SEGMENT 6	S/N	97
SEGMENT 7	S/N	106
SEGMENT 8	S/N	99
SEGMENT 9	S/N	103



LEGEND

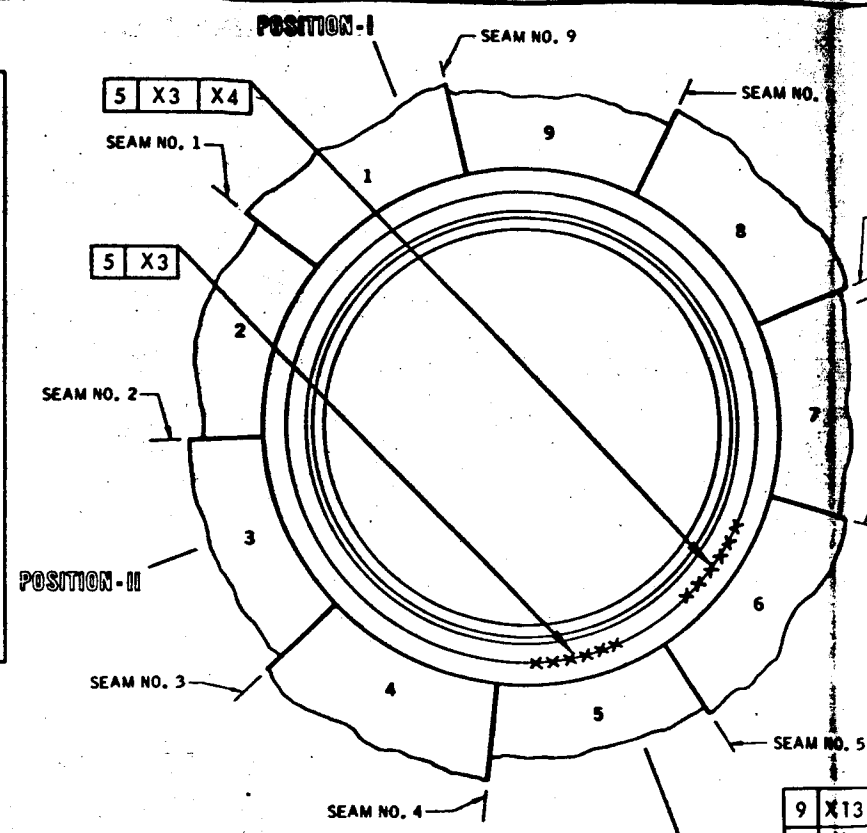
	TABLE II ITEM	FARR NUMBER	DATE	TOTAL DEFECTS	TYPE DEFECT	DETECTED BY	SIDE	REWORKS REQUIRED
1	126	A099482	9-11-64	3	1, 4	X	–	1
2	127	A099487	9-13-64	2	1	D	–	1
3	128	A099490	9-15-64	2	3, 1	D	–	1
4	133	A111976	10-22-64	9	18	V	I	0
5	134	A111977	10-22-64	2	14	V	I	0
6	137	A113928	10-8-64	1	1	D	O	1
7	141	A113954	10-25-64	14	12, 3, 13	X	O	3
8	142	A113960	10-28-64	3	3, 4	D	I	1
9	143	A113972	11-4-64	NUMEROUS	13, 3, 8, 12	X	O	2
10	144	A113980	11-8-64	1	4	D	O	1
11	147	A113991	11-18-64	6	3, 4, 13, 8	X	O	3
12	149	A113998	11-20-64	3	4	D	I	2
13	154	A118274	11-24-64	6	13	D	I	2
14								
15								

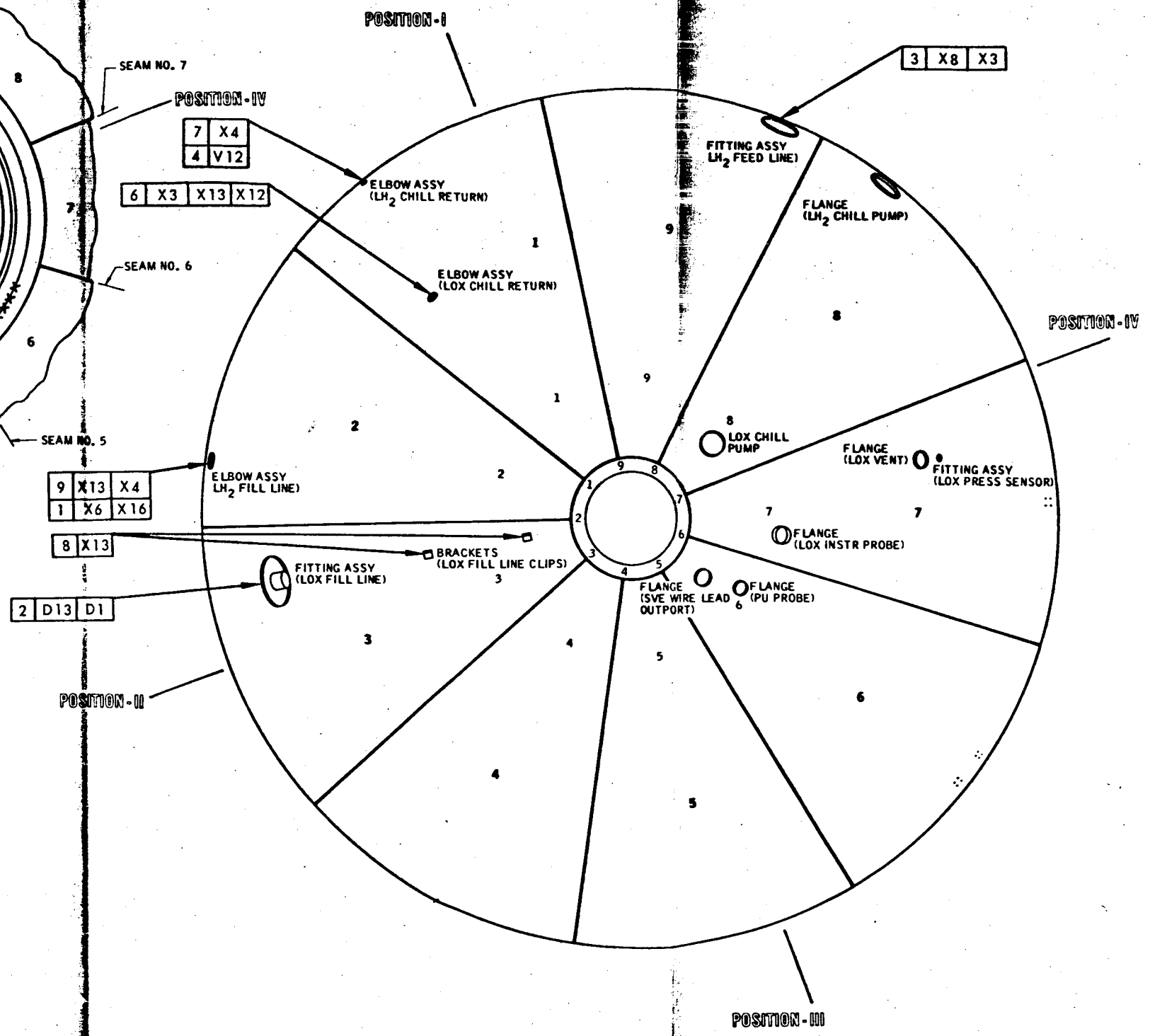
Chart 4. Forward Face Assembly

AFT DOME 1005

PART NUMBER 1A39308-503

SEGMENT 1 S/N	88
SEGMENT 2 S/N	92
SEGMENT 3 S/N	91
SEGMENT 4 S/N	93
SEGMENT 5 S/N	90
SEGMENT 6 S/N	87
SEGMENT 7 S/N	94
SEGMENT 8 S/N	95
SEGMENT 9 S/N	89





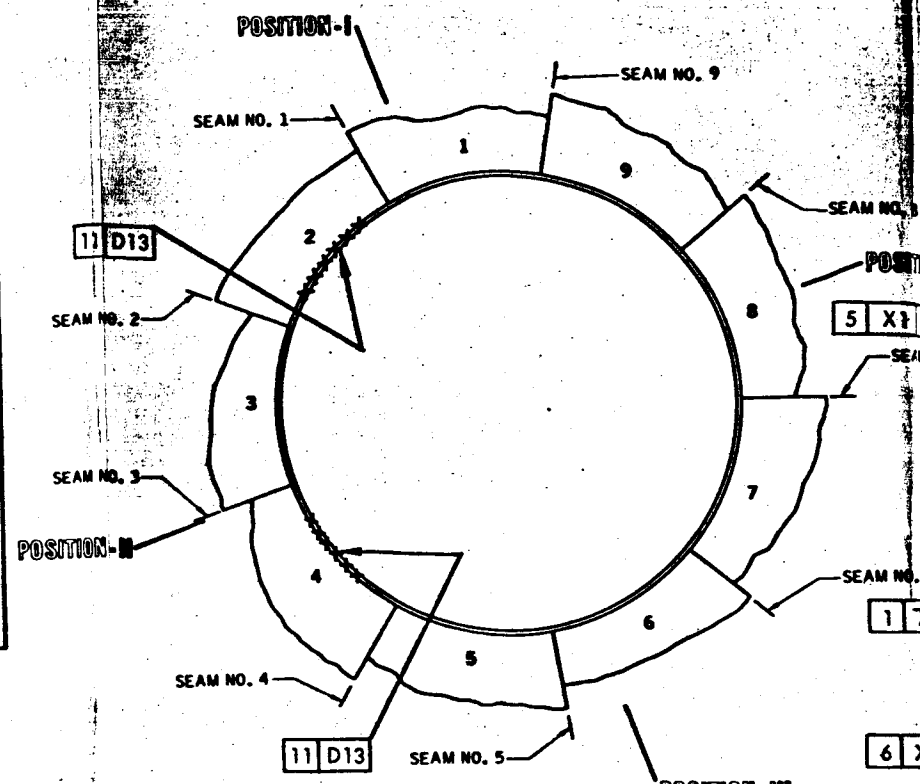
LEGEND

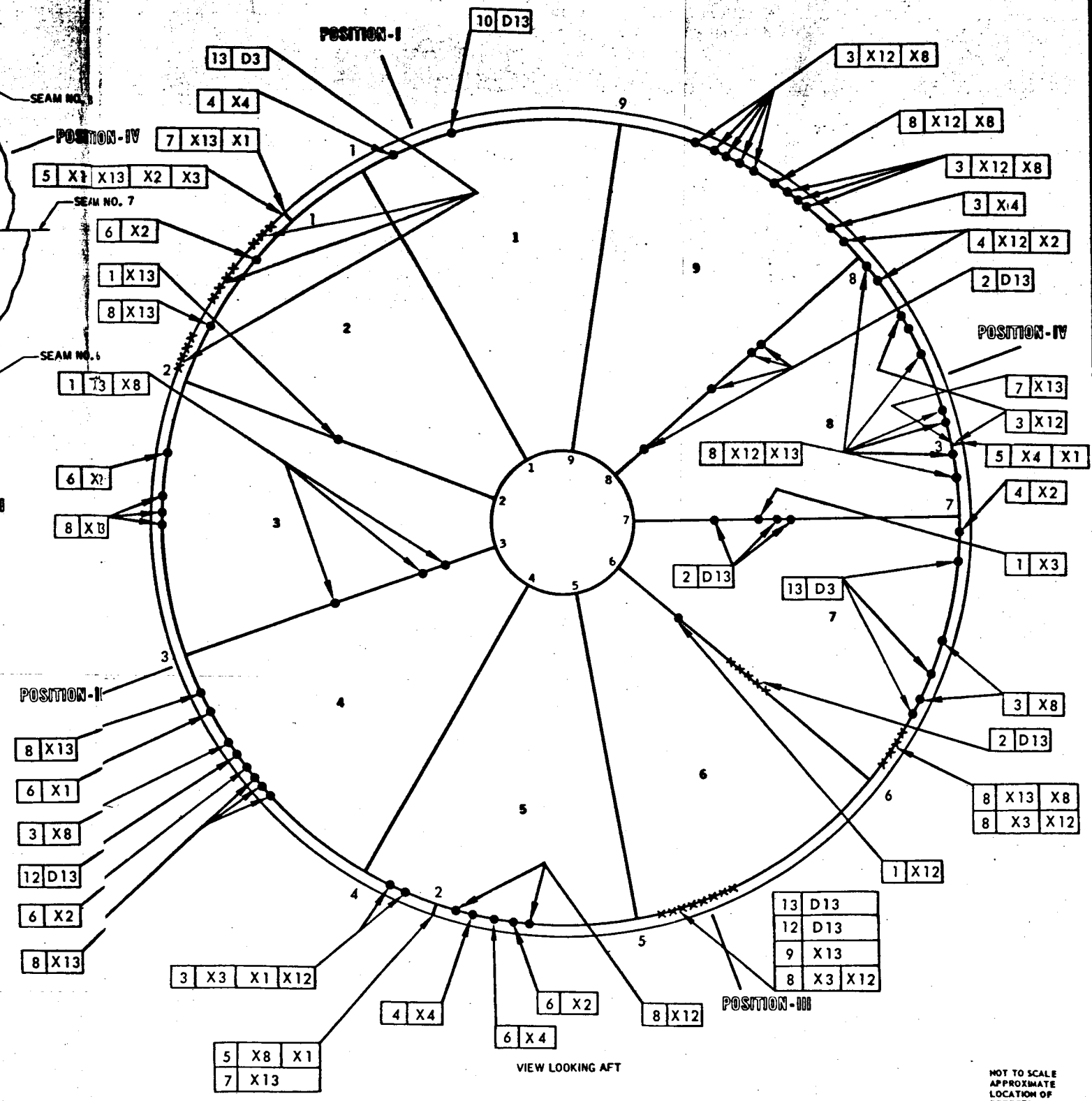
	TABLE II ITEM	FARR NUMBER	DATE	TOTAL DEFECTS	TYPE DEFECT	DETECTED BY	SIDE	REWORKS REQUIRED
1	162	A113982	11-10-64	1	6, 16	X	O	1
2	164	A113988	11-12-64	2	1, 13	D	I-O	1
3	165	A113993	11-18-64	2	8, 3	X	O	1
4	167	A118252	11-6-64	1	12	V	O	1
5	171	A120070	12-16-64	3	4, 3	X	–	0
6	172	A120074	12-21-64	3	3, 13, 12	X	–	1
7	173	A120075	12-22-64	1	4	X	–	0
8	177	A123101	12-23-64	2	13	X	–	0
9	178	A123102	12-28-64	1	13, 4	X	O	0
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Chart 6. Aft Dome Assembly

DOME S/N 00010
RING ASSEM. S/N 00010
AFT FACE S/N 2004
PART NUMBER 1A39286-501

SEGMENT 1 S/N	106
SEGMENT 2 S/N	115
SEGMENT 3 S/N	110
SEGMENT 4 S/N	97
SEGMENT 5 S/N	114
SEGMENT 6 S/N	105
SEGMENT 7 S/N	111
SEGMENT 8 S/N	116
SEGMENT 9 S/N	112





LEGEND

TABLE II ITEM	FARR NUMBER	DATE	TOTAL DEFECTS	TYPE DEFECT	DETECTED BY	SIDE	REWORKS REQUIRED
1	118	A099344	6-27-64	5	13,12,3, 8	X	O	1
2	119	A099355	6-30-64	16	13	D	I-O	3
3	121	A099393	7-21-64	22	8, 3, 1, 12, 4	X	–	2
4	122	A099406	7-28-64	6	4, 2, 12	X	–	1
5	123	A099453	8-25-64	6	1, 2, 3, 4	X	–	2
6	124	A099465	8-31-64	8	2, 1, 4	X	I-O	2
7	125	A099472	9-2-64	3	13, 1	X	–	1
8	138	A113941	10-17-64	NUMEROUS	13,12,3, 8	X	–	1
9	139	A113952	10-24-64	1	13	X	–	0
10	140	A113953	10-24-64	NUMEROUS	13	D	I	2
11	145	A113983	11-10-64	2	13	D	I	1
12	153	A118273	11-24-64	5	13	D	O	2
13	155	A120057	12-1-64	11	3, 13	D	O	1
14								
15								

Chart 5. Aft Face Assembly

APPENDIX 2

CHARTS

APPENDIX 3

TABLES

TABLE I. PERMANENT NONCONFORMANCES AND FUNCTIONAL FAILURE AND REJECTION REPORTS DURING STAGE SYSTEM CHECKOUTS

Section 1. Sacramento Test Center Installation and Checkout

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
1	A156696 9-10-65	Nickel plating was removed from the solenoid internal parts in the LH_2 tank pressurization module, P/N 1B55200-1, S/N 1005, when the armature was machined to the desired dimensions.	The valve was returned to the vendor and reworked per B/P. The reworked part was acceptable.
2	A167238 4-6-66	Relief valve, P/N 7851824-503, on LOX repressurization module, P/N 1B56653-501, S/N 00001, had low reseat pressure of 3100 psig. Pressure should have been 3150 to 3450 psig. Also, the maximum leakage rate of 20 scim at 3150 psig was exceeded to 120 scim.	The module was reinstalled in the vehicle for use during pneumatic checkout. The relief valve was replaced prior to propulsion system checks, phase 5. At the time of the phase 5 checks, leakage in the module, if any, was to be determined.
3	A170524 5-6-66	On APS module two, temperature transducer, P/N 1A68689, S/N A779, the temperature patch leads were broken off from the patch. The defect occurred while removing from engine 3.	The transducer assembly was returned to the vendor for replacement.
4	A179055 5-4-66	On APS module one, coupling, P/N 1B58697-501, S/N C117, leaked helium at approximately 200 psig in the area where the hex joined to the body at the valve end.	The coupling was returned to the vendor for replacement after reidentification per Engineering instruction.
5	A179056 5-10-66	a. Cap of coupling, P/N 1B58697-511, S/N G-106, had a dripping leak when fuel was in the system. b. The coupling had a 2° bend.	The coupling was returned to the vendor for replacement.
6	A179093 5-6-66	On APS module two, engine quad valve "A" stuck in the open position.	The engine was removed.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
7	A179095 5-11-66	Helium fill module, P/N 1A49996-507, S/N 1038, had full flow at 3680 psig, rather than at 3550 psig per B/P 1B49996.	Acceptable to Engineering for use.
8	A179096 5-17-66	On APS module one, per H&CO 1B60943, the chamber pressure was 91 psia during confidence firing of engine 2. 96.3 psia was the minimum allowable pressure.	Engine 2 was removed and replaced.
9	A179100 5-21-66	There was a pinhole leak at the flange end of tube assembly, P/N 1B51492-1.	The end was rewelded, and cleaned,
10	A179102 3-22-66	The following disconnect assemblies, on the aft umbilical plate, were not sealed and protected per DPS43150: a. The ambient helium sphere pressure quick disconnect. b. The APS helium sphere pressure quick disconnect. c. The start tank supply pressure and chilldown disconnect. d. The engine helium pressure supply disconnect. e. The cold helium sphere pressure, and LOX tank prepressurization supply disconnect. f. The thrust chamber purge and chilldown disconnect. g. The start tank vent and relief. h. The fuel pump cavity drain disconnect. i. The prevalve closing backup.	All quick disconnects were removed, cleaned, and reinstalled, maintaining cleanliness in the area. The rework was acceptable.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
11	A179103 3-22-66	a. Pipe assembly, P/N 1B55283-1, was misaligned, and could not be installed between the LH_2 tank pressure control module and the check valve leading to pipe assembly, P/N 1B55528-1.	a. After cleaning and reforming pipe assembly, P/N 1B55283-1, it was made to fit and accepted for use.
		b. There was excessive bend in the radius of tube assembly, P/N 1B55280-1, at the check valve end, causing tube assembly, P/N 1B55283-1, to ride the J-2 engine customer connect panel.	b. After cleaning and reforming tube assembly, P/N 1B55280-1, it was found to have been scratched during rework, and was scrapped.
12	A179106 3-23-66	Tube assembly, P/N 1B59190-1, was not mocked in such a way to be able to pick up clamping hole in panel, P/N 1A88924. With check valve, P/N 1B51361-1, installed, tube assembly, P/N 1B56626-1, was too long to fit between check valves.	Tube assembly, P/N 1B56625-1, was removed. A new bracket, P/N 1A88924-31, was fabricated and installed, and tube assembly, P/N 1B59190-1, was installed on bracket. Tube Assembly, P/N 1B56625-1, was refabricated to prevent preload and reinstalled. The rework was acceptable.
13	A179111 3-24-66	Pipe assembly, P/N 1A96403-1, could not be clamped to the thrust structure without preloading. This assembly also rode hard on the head of a bolt through standoff, P/N 1B27740-517.	A new tube assembly was fabricated per B/P, however, it was found to have excessive bend, and was scrapped.
14	A179114 3-25-66	Control pressure line, P/N 1B43274-1, at LOX vent valve is bent at upper "B" nut.	Tube assembly was scrapped and replaced with new tube assembly, P/N 1B43274-1.
15	A179116 3-25-66	Tube assembly, P/N 1B56786-1, cannot be clamped to thrust structure per B/P without pre-load. Ref. B/P 1B51444, view B, zone 10.	Tube assembly scrapped and replaced by new tube assembly to pick up B/P clamps and eliminate pre-load.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
16	A179118 3-26-66	Tube assembly, P/N 1B56787-1, was approximately 1 inch too long, and could not be connected to module, P/N 1B56633-501. The tube also rode the hold down straps on the restart bottles.	The tube assemtly was removed, and approximately 1 inch of material was cut off the end opposite to the module connection. The area was reflared, cleaned, and tested per B/P, and reinstalled. The rework was acceptable.
17	A179119 3-28-66	a. The belt attaching the aft skirt to the dummy aft interstage was broken off in the hole at stringer 98. b. At stringer 9, 34, 38, 42, 45, 59, 60, 70, 71, 81, 82, 92, 93, 104, 114 to 117, 124, and 137, some thrust washers, P/N 1B43049-1, were trimmed excessively.	a. The belt was removed and replaced. b. Acceptable to Engineering for use.
18	A179120 3-28-66	Tube assembly, P/N 1B58832-1, could not be clamped to stringer 17 per B/P.	The tube assemtly was scrapped and a new one fabricated. This fabrication did not meet production tooling requirements, and the new part was also scrapped.
19	A179121 3-28-66	Per QEC 343, on helium storage tank, P/N 1A49990-1, S/N 25, there were nine dings starting at 1/2 in. from plane B, and about 210°.	The defect areas were satisfactorily checked with both dye penetrant and optical micrometer, and found acceptable.
20	A179123 3-28-66	Tube Assembly, P/N 1B56435-1, was 1/4 in. too short at the module end, when the opposite end was properly installed.	A new assembly was mocked up to fit, however, this assembly did not meet production tooling requirements, and was scrapped.
21	A179125 3-26-66	Tube assembly, P/N 1B55283-1, would not fit between the LH_2 tank pressure control module and the check valve leading to pipe assembly, P/N 1B55282-1.	The misfit assembly was scrapped.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
22	A179151 3-29-66	The bottom half of support, P/N 1B52643-1, was broken.	The support was scrapped.
23	A179152 3-29-66	Tube assembly, P/N 1B29615-1, was 1 1/4 in. too long, and rode hard on tube assembly, P/N 1B56787-1.	The assembly was reformed but still did not fit satisfactorily. It was scrapped and a new assembly was fabricated.
24	A179154 3-30-66	Standoff, P/N 1B37207, on stringer 17, had four threads pulled out.	Keensert was installed per B/P 1B53312. The rework was acceptable.
25	A179155 3-30-66	Metal erosion was suspected on the diffuser wall, J-2 engine.	The condition was reworked per Rocketdyne procedure R-3825-5.
26	A179156 3-30-66	There was a short between pins J2-E and J2-M on excitation module 404A52A7, P/N 1A77310-503, S/N 67.	The module was found to be unacceptable, and was scrapped.
27	A179158 3-31-66	Tube assembly, P/N 1B56626-1, was too long to fit between check valve, P/N 1B51361-1, and tube assembly, P/N 1B59190-1.	The long tube assembly was scrapped.
28	A179159 3-31-66	Several cable assemblies in pneumatic console, P/N 1A98161-1, S/N 00002, had 90° bends and showed insulation damage.	The connectors were cut off at the damaged areas, and the wires were reterminated per B/P.
29	A179160 3-31-66	On liquid level control unit, P/N 1A68710-509, test relay K-2 read 0 VDC rather than 5 VDC per B/P.	The unit was tested satisfactorily per B/P 1A68710, and was accepted.
30	A179161 3-31-66	Control units, P/N 1A68710-511, S/Ns E25 and E38, would not adjust per B/P.	After retest per B/P 1A68710, the units were unacceptable and returned to the vendor for rework to specs.

TABLE I, Section I, (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
31	A179162 4-1-66	Cap assemblies, P/N 1B27629-7, had deep nicks and scratches in the cap faces. Also, screw heads protruded above the countersink. These defects were noted on the thrust structure during pre-firing checkout.	The caps were removed and replaced with new parts per B/P. Screw heads were checked for countersink. The rework was acceptable.
32	A179164 4-1-66	APS weather seal, P/N 1B87429-503, located on fin line 1, was cut and weather damaged.	The seal was scrapped.
33	A179165 4-1-66	Between stringers 14 and 14A, fittings, P/Ns 1B63133-1 and 1B63134-1, had three holes mislocated 180° from callout per B/P 1B62568.	Acceptable to Engineering for use. The area was touched up with zinc chromate primer.
34	A179166 4-1-66	There were wrinkles and 0.015 in. tool marks in the bend areas of tube assembly, P/N 1B57824-1A-001, three places.	The tube assembly was scrapped.
35	A179168 4-1-66	Pipe assembly, P/N 1B53678-1, was misaligned 1/2 in. to 3/4 in., and could not be clamped per B/P to standoff at stringer 6 of the thrust structure.	A new standoff was fabricated and installed per B/P. Bracket, P/N 1B38632-501, was removed, and the noted tube assembly was marriage clamped to assembly, P/N 1B59187-1. The assembly was then clamped to the standoff, and the rework was accepted.
36	A179171 3-31-66	Adjustments had no effect on control units, P/N 1A68710-509, S/Ns E21, E39, and E40.	The units were returned to the vendor for rework per applicable specs.
37	A179172 4-1-66	There was contamination in the interior of the LOX tank, around the insertion port for probe, P/N 1A66585-503J.	LOX clean rags, saturated with freon, were used to clean the interior of the tank, as far as could be reached through the probe port. The rework was acceptable.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
38	A179175 4-4-66	The standoff on stringer 16 was 3/8 in. too long to permit proper installation of clamp assembly, P/N 1B64293-1. The clamp assembly was to hold tube assemblies, P/Ns 1B39777-1 and 1B39778-1.	The standoff was trimmed as necessary to allow the clamp to be installed. Keensert was installed in the trimmed standoff. The rework was acceptable.
39	A182866 2-24-66	There were 1/2 in. hairline cracks noted in welds at three points at the junction of wall, P/N 1B28702-1, and roof, P/N 1B28705-1.	The cracks were ground out and rewelded, and stiffeners were installed per B/P 1B28705. The rework was acceptable.
40	A188026 4-2-66	All cable connectors from the J-2 engine to the customer interface panels were not cross safety wired. This defect was discovered during performance of H&CO 1B40653.	Safety wires were installed per B/P. The rework was acceptable.
41	A188027 4-4-66	Tube assembly, P/N 1B56786-1, was installed preloading the LH_2 repressurization module.	The tube assembly was scrapped and was replaced by a newly-fabricated assembly.
42	A188029 4-4-66	Per disposition of FARR A184714, the electrical switch on shutoff valve, P/N 1A49965-509, S/N 0207, had continuity between pins E and F, rather than between pins D and E, in the open position.	The valve was removed from the pump, P/N 1A49423-1. It was then returned to the vendor for rework to applicable specs and updating to the latest configuration.
43	A188030 4-4-66	Two of three nutplates, P/N 1B38982-1, located at the bottom right on panel, P/N 1B51298-1, were mislocated. Distance from the center of each nutplate to the center of the bottom nutplate should have been 2.000 in. per B/P 1B51298NC. Actual locations of the three nutplates were 2.000, 1.500, and 0.875 in. from the bottom plate.	Blocks, P/N 1B39010-501, were installed on either side of the middle hole. Holes were drilled for spacer nuts, P/N 1B38982-1, per B/P, and nuts were installed. The nutplates were not relocated, and the mislocated holes remained open. The rework was acceptable.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
44	A188032 4-5-66	During calibration of power detector, P/N 1A74776-501, S/N 2-0217, output could not be adjusted down to 110 millivolts when a 22 watt input was applied. Defect was discovered when testing per H&CO 1B44472.	The condition was reworked per B/P 1A43833. The rework was acceptable.
45	A188034 4-5-66	Pipe assembly, P/N 1A96374-1, showed no indication of heat treating on the sleeves.	The tube assembly was scrapped.
46	A188035 4-5-66	Pipe assembly, P/N 1A37316-1, showed no indication of heat treatment on the sleeves.	The tube assembly was scrapped.
47	A188036 4-6-66	The open and closing pneumatic ports of spark ignitor valve, P/N 308880, S/N 4075231, were scratched on the sealing surface.	The scratches were polished out, going no deeper than the scratch depth. The rework was acceptable.
48	A188037 4-6-66	The sealing surface on the flange of the LH_2 chilldown pump was damaged at the inlet to the LH_2 tank.	Burrs were removed, and sharp edges polished down. The area was touched up with alodine per DPS 9.45, and wiped out with an instrument cloth moistened with MEK. The rework was acceptable.
49	A188038 4-6-66	Tube assemblies, P/Ns 1B39783-1A and 1B39772-1A, were not removed and replaced per FARR A184715 disposition. Hydraulic system leaks noted in A184715 no longer existed after rework at STC.	Acceptable to Engineering for use.
50	A188040 4-7-66	DC output voltage from power detector 411A90MT730, P/N 1A74776-503, S/N 2-0182, was 89 millivolts. It should have read less than 81 millivolts per H&CO 1B44472.	The detector was reworked per B/P 1B43833 and accepted.
51	A188042 4-7-66	Pipe assembly, P/N 1B37316-1, was 1/2 in. to 1/4 in. too long to fit between the No. 3 bottle boss and the welded "T".	The pipe assembly and bottle boss were reformed to fit and accepted for use.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
52	A188043 4-11-66	DC output voltage from power detector 411A97MT-722, P/N 1A74776-503. S/N 2-0155, was 56.3 millivolts, and could not be adjusted down to 50 ± 3 millivolts per H&CO 1B44472.	The detector was reworked and retested per H&CO 1B43833. The rework was acceptable to Engineering for use.
53	A188045 4-11-66	DC output voltage from power detector 411A98MT732, P/N 1A74776-503, S/N 2-0140, was 20 millivolts, and could not be adjusted to 82 millivolts per H&CO 1B44472.	The detector was reworked per B/P 1B43833. The unit was then returned to the vendor for rework per spec.
54	A188046 4-11-66	The following defects were noted on support assembly, P/N 1B37826-503, located at stringer 7A, thrust structure: a. The support was inadvertently removed from the stringer. b. Two rivets were drilled out.	The support assembly was replaced per B/P, using fasteners, P/N NAS 1669-08K4 on each support in blind area. The rework was acceptable.
55	A188047 4-11-66	Output relay of level sensor control unit 411A92A25, P/N 1A68710-509, S/N E-41, would not respond to wet condition on command.	After testing per B/P 1A68710, the unit was returned to the vendor for rework to applicable specs.
56	A188048 4-12-66	Tube assembly, P/N 1B56626-1, was bent flat.	The tube assembly was scrapped.
57	A188049 4-12-66	Wire bundle 411W283, P/N 1B50895-1, at stringer 108 of the forward skirt, had a cut and pinched area, 1/8 in. x 1/8 in. in the insulation and shielding.	The affected wire was removed and replaced per B/P.
58	A188050 4-12-66	a. Level sensor transducer L0504 on hydraulic accumulator reservoir, P/N 1B29319-519, S/N 001, had a potentiometer wiper stuck in the "full" position.	a. Acceptable to Engineering for use after recheck.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
58 (Cont.)	A188050 4-12-66	b. Pin A of the same transducer was bent over, as was pin C.	b. The pins were bent into place, and the mating connectors were removed and replaced. The rework was accepteable.
59	A188076 4-17-66	At station 620 in the forward skirt area, the skin of stringer 25 was cut in two places. One LZ5 rivet would not completely fill the hole.	The damaged area was touched up with zinc chromate. Otherwise, the condition was acceptable to Engineering for use.
60	A188077 4-12-66	a. The flex section of duct assembly, P/N 1A87736-1, exceeded the maximum allowable angulation per QEC 999 and B/P 1A59098. The angulation was 5/32 in., should have been 1/8 in. maximum. b. The maximum angulation of dimension J was 2 3/4 in. B/P tolerance was 1°30' maximum. After rotating check valve 180°, the condition still existed.	Brackets, P/Ns 1B34594-23 and -25, were trimmed to permit reinstallation of the check valve. The situation was acceptable after the valve and brackets were repositioned. FARR A188126 was written against this rework.
61	A188078 4-12-66	Plug P1 of wire 403A404, cable assembly, P/N 1B49554-1, had a damaged socket A, and damage to the insert.	The damaged plug was removed and replaced per B/P. The rework was acceptable.
62	A188079 4-13-66	Tube assembly, P/N 1B56665-1, was malformed, causing it to ride hard on tube assembly, P/N 1B62798-1, where both assemblies routed beneath the LOX repressurization module.	The defective assembly was scrapped.
63	A188080 4-13-66	J-2 engine temperature transducer bulbs were suspected of having variable amounts of silicone heat sink compound (DC-340) under them.	The transducers were reworked per technical bulletin R-3825-3-19. The rework was acceptable.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
64	A188081 4-13-66	The screen inside cold helium module, where it attached to tube assembly, P/N 1B62804-1, was contaminated with metal filings, during an attempt to repair a blowing leak at the "B" nut on tube assembly, P/N 1B32913-1A.	The LOX tank vent and pre-pressurization valves were opened, and the areas purged at 1000 psi. The LOX prepress valve was closed, and the cold helium shutoff valve were open until the helium bottles were ambient. The tube assemblies were disconnected, all screws were examined, and the condition found acceptable to Engineering.
65	A188082 4-14-66	There was suspected contamination of module, P/N 1B42290-5, S/N 0008, due to metal particles found in the screen.	The module was routed to LOX service for cleaning per B/P and specs.
66	A188083 4-14-66	Coupling coefficient for reflected power on the bi-directional coupler 411A98A203, P/N 1A69214-503, S/N 0011, was 28 ± 0.5 db. It should have read 30 ± 0.5 db. per H&CO 1B44472.	The coupler was removed and replaced.
67	A188084 4-14-66	Pin A, plug J2 of decoder assembly 411A94A61-A214, P/N 1A74053, S/N 046, read 28 VDC on low calibration. It should have read 6 VDC per H&CO 1B44474.	The decoder unit was removed and replaced.
68	A188087 4-15-66	Adjustment screws on accelerometers, P/N 1A68707-591, S/Ns 379 and 643, were not environmentally sealed per B/P 1A68707.	The accelerometers were successfully tested per B/P 1A68707, and were accepted for use.
69	A188088 4-15-66	Ambient reading from pressure transducer, P/N 1B40242-559, S/N 559-1, was 24 psi.	The transducer was acceptable after checkout per B/P 1B40242-559.
70	A188089 4-15-66	There was a brown residue inside tee assembly, P/N 1A59434-501, on the LOX relief valve.	The LOX relief valve assembly was removed, and stained areas of the tee were wiped clean with freon, PCA (DPM 2482-1). The valve was then replaced. FARR A188091 was written against the rework per this disposition.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
71	A188090 4-15-66	Clevis for strap assembly, P/N 1B27629-501, for helium bottle 1, rode the pneumatic panel.	After the panel edge was ground out and sealed per DPS 22150, the condition was accepted by Engineering for use.
72	A188091 4-15-66	Brown stains, found at the LOX tank vent outlet tee, were not removed with freon-soaked cloths per FARR A188089.	The LOX vent outlet tee was removed and replaced per B/P.
73	A188093 4-16-66	At forty locations on the thrust structure, clevis pins in strap assembly, P/N 1B27629-501, had approximately 3° to 6° pulloff from brackets, P/N's 27632-1 and -2, of the bottle support assembly, P/N 1B39870.	Subsequent to structural investigation the items were reworked to B/P.
74	A188094 4-16-66	Tube assembly, P/N 1B63058-1, was too short, and was not formed properly to allow installation.	Acceptable to Engineering for use.
75	A188098 4-18-66	Measurement C-6 from temperature bridge 404A65A215, P/N 1A82274-533, S/N C1118, was 439° F, should be ambient.	The bridge was scrapped.
76	A188099 4-19-66	Support installation, P/N 1B57026, for the propulsive vent valve, had dimension of 7.50 in. or 39° 70' ± 0° 15". B/P callout for this dimension was 7.44 in. or 39° 55' ± 0° 15" per B/P 1B57026.	The supports were removed, and blank supports were installed and drilled out for installation of the valve assembly. The rework was accepted.
77	A188126 4-19-66	After rework per FARR A188077, the angulation of dimension "J" on duct assy, P/N 1A87736-1, was 2° and should have been 1° 30' maximum per B/P 1A59098.	Acceptable to Engineering for use.
78	A188127 4-19-65	The ears of strut assembly, P/N 1B39835-1, were bent, twisted, and cut.	Fittings were replaced per B/P and specs. The areas were replaced per B/P. The rework was acceptable.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
79	A188128 4-19-66	Fitting on pressure switch, P/N 1B52623-503, S/N 003, showed no evidence of having been cleaned.	The fitting was cleaned per DPS 43000. The rework was acceptable.
80	A188129 4-19-66	Fitting on pressure switch, P/N 1B52624-503, S/N 10, showed no evidence of being cleaned.	The switch was routed to LOX service for cleaning per DPS 43000. The cleanup was acceptable.
81	A188130 4-19-66	The following items were lodged at the junction of the forward dome and the forward skirt: a. One fine wire, 2 1/2 in. long, 2 in. from stringer 24, 4 in. above the junction. b. One fine wire, 2 1/2 in. long, 2 in. from stringer 25, 4 in. above the junction. c. One crimp pin and two pieces of wire, 1 1/2 in. from stringer 27, 4 in. above the junction. d. A piece of twisted wire or solder, 1/2 in. from stringer 42, 9 in. above the junction.	Acceptable to Engineering for use.
82	A188132 4-20-66	Transducer kit 425MT601, P/N 1B40242-5551, S/N 551-7, read 10.2 to 16.3 psi at ambient conditions. This discrepancy was noted during checkout per H&CO 1B70213.	The unit was tested per B/P 1B70338B and accepted for use.
83	A188133 4-20-66	One 0.318 /0.338 in. diameter hole in pan, P/N 1B32995-9, for the installation of fitting, was located 12 7/16 in. from station 615.702. Location per B/P 1B32995 should have been 1 7/16 in. from station 615.702.	The condition was reworked per salvage SEO 1B58000-A45-1.
84	A188134 4-21-66	Stud pin, P/N 1B29309-1, on the LOX fill and drain tube assembly adapter, aft skirt, had damaged threads.	The damaged stud was removed and replaced per B/P. The rework was acceptable.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
85	A188135 4-21-66	There was a 3 in. x 0.015 in. x 0.005 in. scratch in the helium storage tank, P/N 1A49990-501, S/N 20, approximately 265° from the leak check port, 4 in. below plane A.	The edge was smoothed using no. 300 silicon carbide cloth. The tank was re-proofed and cleaned per DPS. The rework was acceptable.
86	A188136 4-21-66	The following defects were noted in helium storage tank, P/N 1A49990-1, S/N 25: a. Three dings, 8 in., 9 in., and 10 in. above plane B, 180° from leak detection boss. b. Two oxidation spots, 3 in. and 4 in. above plane B, 90° from leak detection boss. c. One ding, 2 in. below plane A, 45° from leak detection boss. d. One ding, below plane A, 90° from leak detection boss.	All dinged and scratched areas were polished to remove extruded metal with no. 300 grit silicon carbide cloth. The tank was proof tested and cleaned, and the rework was accepted.
87	A188137 4-21-66	The ambient reading from pressure transducer, P/N 1B40242-507, S/N 507-3, was 12 psi.	The transducer kit was returned to the vendor for rework to spec.
88	A188139 4-21-66	The LOX high pressure duct flowmeter was spun for approximately three minutes.	After checking the meter for damage, Engineering accepted it for use.
89	A188141 4-22-66	One .377/.383 in. diameter hole through angle segment, P/N 1A58609-501, in the forward skirt area, was mislocated approximately 1 3/8 in. toward stringer 26 from stringer 25.	Acceptable to Engineering for use.
90	A188142 4-22-66	The spotface finish of port CG 1, J-2 engine, was rough, preventing the system from holding its seal. The sealing surface was scratched.	The seal area was refinished to approximately 16 RMS. FARR A188147 records further disposition of these defects.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
91	A188143 4-22-66	Tube assembly, P/N 1B59190-1, located at stringer 6 on the thrust structure, was twisted, indicating strain.	The assembly was removed and replaced, and the rework accepted.
92	A188144 4-22-66	Pipe assembly, P/N 1B63251-1, was 9/16 in. too long in the straight section, and therefore could not be installed to cross, P/N MC163C4, as required per B/P 1B58001.	The pipe assembly was scrapped.
93	A188145 4-22-66	Low gain DC amplifier, P/N 1A94910-505, S/N 00231, for measuring M10-411 low cal, drifted in excess of 0.300 VDC on both low and high cal points. Maximum tolerable drift was 0.060 VDC.	The amplifier was retested per B/P 1A94910, and the defect was not repeated. It was then accepted for use.
94	A188146 4-23-66	a. In the LH_2 tank, one 0.3120/0.3180 in. diameter hole through fitting, P/N 1B43609, was undersize by 1/32 in. b. On the forward dome, a buildup of resin and fiberglass on the outer edges of the nodes on fitting, P/N 1B43609, would not allow installation of B/P bolt and nut.	a. The hole was drilled out to B/P size. b. The excess materials were trimmed back as necessary to clear attachments. Exposed balsa was covered with gap filler per DPS 23003. All rework was acceptable.
95	A188147 4-23-66	The outer radius of the spotface of J-2 engine port CG1 was too large to allow the seal to seat properly.	A new seal was installed which failed a leak check at 300 in. lbs. torque. Another seal was installed and torqued to 70 in. lbs. It was leak checked and accepted.
96	A188150 4-22-66	On range safety controller, P/N 1B33084-1, S/N 00014, the resistance measured from pin K, connector J4, wire run 411A97A19, to ground, was 30 K. Measurement should have been 5 K. Also, the voltage reading from pin K to ground was 7.50 VDC, should have been 1.2 VDC.	The controller was returned to the vendor for rework to specs.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
97	A188226 4-25-66	Both the aclar cover on the bellows insulation, and the insulation itself, were torn, exposing the bellows in duct assembly, P/N 1A94469-503.	The aclar covering was removed and replaced. The rework was acceptable.
98	A188228 4-26-66	The following defects were noted when testing relief valve, P/N 7851824-503, S/N 1024: a. Reset psig was 3100; should have been 3150 to 3450 psig. b. Leakage at 3150 psig was 120 SCIM, exceeding the allowable maximum of 20 SCIM.	The valve was returned to the vendor for rework to spec.
99	A188229 4-26-66	On panel 403A73 in the LH_2 repressurization module, there were nicks and scratches around the inlet pressure port sealant surfaces, allowing joint leakage.	Three control orifices and two straps, P/N 1B63350-1, were removed from the module, and sent to the vendor for replacement. The module was installed in the vehicle for prefire checkout only, until the replacement arrived. The replacement was satisfactory.
100	A188230 4-26-66	There were nicks and scratches on the top angle bolting flange sealing surface of tube assembly, P/N 1B64384-1, at the connection point to module, P/N 1B55200-505L.	The sealing surface was cleaned with crocus cloth, and the opening of the tube was wiped clean with an instrument wiping cloth. The opening was then moistened with MEK to remove polishing dust. The rework was acceptable.
101	A188232 4-27-66	Wire run 411W17E25 on cable assembly, P/N 1B56381-1C, S/N 00001, had damaged insulation in two places at stringer 19.	The wire was removed and replaced, and the replacement was satisfactory.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
102	A188238 4-27-66	There was a sheared mounting stud screw on panel isolator, P/N 1B54125-1A, S/N 001, located at aft skirt panel position 18C, stringer 10.	The isolator was removed and replaced per B/P. The rework was acceptable.
103	A188240 4-27-66	There was a cut in the teflon shielding, and wire D1191 was damaged. This wire was part of wire harness 404W209AT424MT609, P/N 1B44906-1, S/N 00001, and the cut was located 7 in. from connector J-1.	The damaged portion of the wire was cut off, and the wire was reterminated. The rework was acceptable.
104	A188241 4-28-66	First stage opening time of J-2 engine main oxidizer valve, P/N 41031, was too long. Opening time should have been a maximum of fifty milliseconds.	The oxidizer valve was removed and replaced.
105	A188242 4-28-66	High and low racs calibration signals caused sporadic output on the signal indication from meter, P/N 1B52861, S/N 4, when a 28 VDC signal was applied.	The meter was returned to the vendor for rework to B/P.
106	A188243 4-28-66	Ambient helium bottle straps, P/N's 1B43324-3 and -9, were too wide. Width of the straps was 0.600 in. The B/P width was 0.550 in.	Acceptable to Engineering for use.
107	A188244 4-28-66	The following accelerometers, P/N 1A68707-7-002, had a 5 VAC peak to peak output when a 5 VAC RMS input signal was applied. The output should have been 4 VAC peak to peak. The amplifiers were: a. Location 411MT685E109, S/N 337. b. Location 404MT702E105, S/N 181. c. Location 411MT693E117, S/N 196. d. Location 411MT676E097, S/N 318.	After retest per B/P 1A68707-7, the accelerometers were accepted by Engineering for use.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
108	A188246 5-2-66	The output repitition rate of the flow rate and turbine speed module, P/N 1A87294-503, was approximately 67 pps. The rate per H&CO 1B55820, should have been 40 pps.	The module was removed and replaced with a new part. The rework was accepted.
109	A188247 4-30-66	Connector was broken off accelerometer 401MT7254A, P/N 1A68707-591, at the engine fuel low pressure inlet.	The accelerometer was returned to the vendor for rework to specs.
110	A188248 4-28-66	Pressure transducer 424MT600, P/N 1B43324-537, S/N 13-1, read mid-scale at ambient conditions. The transducer had no output at any pressure setting.	The transducer was returned to vendor for rework to spec.
111	A118249 4-29-66	Output from PCM/DDAS Model 302 indicated random noise for all stage measurements. Checkout of the PAM system revealed proper power inputs and outputs.	The PCM/DDAS was tested per B/P 1B37820, with the same defect occurring. The P/C boards were removed and tested.
112	A188250 4-29-66	There were scratches on the internal sealing surface of the flare end of the tube assembly, P/N 1A97088-1, resulting in leakage.	The B nut at the joint was backed off and retorqued to the maximum torque value. The joint passed a subsequent leak check.
113	A191902 5-2-66	Tube sleeves on tube assemblies, P/N's 1B37322-1 and 1B37327-1, were not identified as to heat treat status.	The tube assemblies were removed and replaced. The rework was acceptable.
114	A191904 5-2-66	The following defects were noted in temperature transducer 403MT657, P/N 1A67863-503: a. Pins A to C read open, should have read 570 ohms. b. Pins B to C read open, indicating a short.	The transducer was returned to the vendor for rework to spec.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
115	A191908 5-3-66	The following misfit parts were located in the thrust structure: a. At stringer 22A, standoff did not fit tube assembly, P/N 1A96940-1. b. At stringer 18, bracket, P/N 1A95646-001-3, did not fit tube assembly, P/N 1A96374-1. c. At stringer 11 1/4, standoff did not fit tube assembly, P/N 1B37316-1.	All defect areas were reworked per Engineering instructions to clear and fit. The rework was acceptable.
116	A191909 5-3-66	The J-2 engine LOX and LH_2 flow meters both spun in reverse twice.	Acceptable to Engineering for use.
117	A191910 5-3-66	The ambient helium bottle support straps were 1.250 in. wide. They should have been 1.500 in. wide per B/P 1B27629.	The straps were removed and replaced. The rework was acceptable.
118	A191911 5-3-66	Output at pin D, accelerometer 411MT605E93, P/N 1A88599-503, was 2 volts peak to peak at 2.5 VDC bias. Output should have been 4 volts peak to peak per H&CO 1B55815.	The accelerometer was returned to the vendor for rework to specs.
119	A191912 5-3-66	Output at pin D, accelerometer 427MT604E119, P/N 1A68707-525, S/N 254, was 60 cycle, 3.4 VRMS. Output should have been 400 cycle, 4 volts peak to peak, and 2.5 VDC bias per H&CO 1B55815.	The amplifier was repaired and recalibrated. Upon retest, it was accepted for use.
120	A191913 5-3-66	3/4 in. MC-125 teledyne sleeves in two places on pipe assembly, P/N 1A96373-1-001, were not identified as to heat treat status.	The flared sections of tube assemblies, P/N's 1B37327-1 and 1B37322-1, were cut at welds. New parts were made and welded into the assembly, maintaining proper length and alignment.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
121	A191914 5-3-66	LH_2 ground fill and flight control pressure switch, P/N 1B52624-501, S/N 004, was 0.3 psig low on first actuation only.	Acceptable to Engineering for use.
122	A191917 5-4-66	Amplifier 411A91A63A213, P/N 1A82395-1, S/N 1726, drifted on low and high cal ambient valves.	After testing per B/P 1A82395, the amplifier was accepted by Engineering for use.
123	A191918 5-4-66	Mounting stud for isolator, P/N 1B54125-1, S/N 001, located on aft skirt panel position 18C, stringer 10, was sheared.	The isolator was returned to the vendor for rework to specs.
124	A191919 5-5-66	There were sharp dings across tubes 249, 251, and 252 inside the thrust chamber, approximately 11 1/2 in. below the throat exit. The dings measured 0.062 in. x 0.007 to 0.023 in. x 0.125 in.	Acceptable to Engineering for use.
125	A191920 5-5-66	Wires were cut off temperature transducer 401MT696, P/N 1A68589-509, S/N 8642, to enable the removal of the hydraulic pump.	The transducer was scrapped.
126	A191921 5-7-66	At thrust structure stringer 13 1/4, tube assembly support bracket, P/N 1B39018-1, was mismatched with tube assembly, P/N 1B44632-1, by approximately 3/4 in.	The condition was reworked per SEO 1A39018-A45-1.
127	A191945 6-6-66	The mounting flange was torn loose from the elbow of adapter, P/N 1B71195-1, and the large radius of the elbow was bent.	The mounting flange was cut off along the tear line, and the area was straightened and reworked per B/P.
128	A191946 6-7-66	The ceramic coating was broken off at the end of transducer, P/N 1A68589-521, S/N D992.	The transducer was returned to the vendor for replacement.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
129	A191948 6-8-66	Pressure transducer 425MT601, P/N 1B40242-551, S/N 551-7, read 300 psi high.	The discrepancy could not be duplicated, and the rework was accepted.
130	A191949 6-8-66	Pressure transducer 404MT747, P/N 1A97442-1, S/N 173, read high at ambient.	The transducer was returned to the vendor for rework to applicable specs.
131	A191950 6-8-66	Pressure transducer, P/N 1B40242-507, S/N 507-3, read high on the low end of the scale. This defect was noted during testing per H&CO 1B55840.	The transducer was retested per B/P 1B70338, found to be acceptable, and accepted for use.
132	A191976 5-10-66	One vehicle tie-down in the left hand side of frame splicing plate, P/N 1B29732-1, was frozen in the threads of the ring attach plate.	The hole was blown out, after removing the bolt, with a low pressure air nozzle. The threads were chased with tap, and the rework was accepted.
133	A191977 5-10-66	The plastic protective cover around the bellows of pipe assembly, P/N 1A78053-1, was torn in several places.	The plastic cover was removed and replaced per B/P.
134	A191978 5-10-66	At pin 14 of cable assembly 411W302A1, P/N 1B44917, S/N 00001, the insulation was torn on the 20 gauge wire, showing the copper conductor.	The damaged wire was drawn carefully through the grommet until repairs could be made. The assembly was returned to its original configuration.
135	A191981 5-11-66	Between stringers 34 and 35, forward skirt, coaxial cable assembly, P/N 1B40242-509, S/N 137, had its outer cover damaged, exposing the shield at the macarta block.	The cable assembly was removed and replaced by a new B/P part.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
136	A191982 5-11-66	Pressure transducer, P/N 1B33359-501, S/N 1069, wiper contact, pin B, was open.	The transducer was returned to the vendor for replacement.
137	A191983 5-11-66	The following defects pertained to pressure transducer system 410MT601, P/N 1B40242-509, S/N 509-6: a. The cable outer insulation and shielding was damaged, approximately midway down the cable run. b. The amplifier, S/N 137, had erratic output.	a. The damaged cable was replaced. b. The discrepancy could not be duplicated during testing per B/P 1B70338 B, and the unit was accepted.
138	A191984 5-12-66	Approximately five holes in thrust structure firing door, P/N 1B60233-1, did not align with holes in the thrust structure. Also, a 0.030 in. gap existed at the lower ends of door stringers.	The holes were aligned per B/P 1B60233A, and a shim was installed to fill the noted gaps. The shim was finished with alodine and primer. The rework was acceptable.
139	A191987 5-13-66	a. No master frame syncs were going on flight recorder, P/N 1A66884-501, S/N 008, tape, making it impossible to sync on data.	After several retests, the recorder was returned to the vendor for replacement.
140	A191989 5-13-66	There were numerous holes in duct assembly flex, P/N 1B60221-31, allowing GN_2 to escape during purging.	The condition was unacceptable and the assembly was returned to the vendor for replacement.
141	A191995 5-14-66	There was a heavy leak between the actuator and the microswitch housing during operation of LOX chilldown valve, P/N 1A49965-513-008A, S/N 00002.	The valve was returned to the vendor for rework per applicable spec.
142	A191997 5-17-66	Thrust chamber chilldown and purge quick disconnect, P/N 1A49958-533, S/N 19, separated when high pressure gas flowed, causing flow stoppage.	The disconnect was returned to the vendor for rework and replacement of defective hardware.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
143	A191998 5-18-66	Pressure transducer 403MT604, P/N 1B31356-503, S/N 208-1, read 250 psi low.	The transducer was returned to the vendor for rework to applicable specs.
144	A191999 5-18-66	Pressure transducer 424MT617, P/N 1B40242-507, S/N 507-5, had no output.	After retest per B/P 1B70338, the transducer still did not respond when pressure was applied. It was returned to the vendor for rework to specs.
145	A192000 5-20-66	ASI ignition detector probe, P/N NA5-27298T2-1, S/N 102, had erratic output.	The probe was returned to Rocketdyne for rework to specs.
146	A192003 5-21-66	There was a 3 in. x 1 in. x 1/8 in. dent in the aft dome, as well as several scratches and pits.	All external welds were dye checked per DPS 15101. Surface castings were made and re-dye checks conducted. Pitted areas were smoothed out to a ratio of 10:1. Reworks were acceptable to Engineering for use.
147	A192006 5-21-66	There was a burn hole in diffuser assembly, P/N G-4070, S/N J-1001, about 1 1/2 in. x 1/2 in.	The diffuser was returned to Rocketdyne for replacement.
148	A192008	The following components were damaged during LH_2 fill system overpressurization: a. Fuel fill and drain valve assembly, P/N 1B48240-501, S/N 0017; mounting ears broken off. b. Tube assemblies, P/N's 1B58809-1, 1B52468, 1B52467, and 1B59303, were bent and crimped. c. Bracket assembly, P/N 1B55409-1, was broken. d. Tee angle bracket, P/N 1B55410-2, was broken.	a. through g. and i. Defective and damaged parts were removed and replaced. h. The area was dye checked for cracks and accepted. Further disposition of these parts was noted on FARR's A191010 to A191015, A191016, A191017, A192018, A191021, A191022, and A191023.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
148 (Cont.)	A192008 5-21-66	e. Panel, P/N 1B39221-153, was delaminated, exposing honeycomb.	
		f. Bracket, P/N 1B55616-1, was broken.	
		g. Wires Q17A22 and P18A22 in wire harness, P/N 1B50230, were pulled out of plug assembly P16.	
		h. The edge of the outer skin of the aft skirt, at the exit port for the fill line assembly, was bent out approximately 10°.	
		i. Fill assembly, P/N 1A78053-1, S/N 18, had bellows expanded and badly distorted.	
149	A192009 5-21-66	During static firing, the ASI probe was erratic, and the engine control helium sphere gauge read over 5000 psi. The GSE engine diffuser burned through, the cold helium crossover valve had a blowing leak, and several valves failed to respond to commands.	Defective parts were removed and replaced, and accepted upon testing.
150	A192010 5-21-66	Tube assembly, P/N 1B5930-1, was bent and crimped at the "B" nut on one end.	The tube assembly was unacceptable, and was scrapped.
151	A192011 5-21-66	Tube assembly, P/N 1B52468-1, was bent and crimped at the "B" nut, at one end only.	The assembly was scrapped.
152	A192012 5-21-66	Tube assembly, P/N 1B58809-1, was bent, and would not fit properly point to point.	The tube assembly was scrapped.
153	A192013 5-21-66	Tube assembly, P/N 1B52467-1, was bent at the "B" nut at one end, and at approximately midway of the assembly.	The tube assembly was not acceptable to Engineering, and was scrapped.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
154	A192014 5-21-66	Mounting lugs on the body of LH_2 fill and drain valve, P/N 1A48240-501, S/N 0017, were broken off.	The valve was returned to the vendor for rework to applicable specs.
155	A192015 5-21-66	Bracket, P/N 1A55409-1, had mounting lug broken at one end only.	The bracket was scrapped.
156	A192016 5-21-66	Bellows assembly, P/N 1A78053-11, was expanded and badly distorted.	The bellows assembly was scrapped.
157	A192017 5-21-66	Fuel fill duct, P/N 1A77906-1, S/N 18, had bellows assembly expanded and distorted.	The assembly was returned to the vendor for replacement.
158	A192018 5-21-66	A leg was broken off bracket, P/N 1B55410-2.	The bracket was scrapped.
159	A192021 5-21-66	Panel, P/N 1B39221-153, was delaminated, exposing honeycomb.	The panel was not acceptable for use, and was scrapped.
160	A192022 5-21-66	Approximately 2 in. by 1/4 in. piece of bracket, P/N 1B55616-1, was broken off.	The bracket was scrapped.
161	A192025 5-23-66	Numerous supports and standoffs were partially debonded following static firing activities.	All debonded parts were removed and replaced per B/P.
162	A192023 5-23-66	Bracket assembly, P/N 55410-1, was subject to an excessive amount of stress during post-firing tank purging.	The bracket was scrapped.
163	A192030 5-27-66	There was suspected cracking of the LOX turbopump turbine wheels, because this condition had existed on previous vehicles.	The wheels were removed and dye checked. No cracks were discovered and the wheels were reinstalled per B/P.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
164	A192035 5-31-66	The probe end at temperature transducer 403MT743-C0275, P/N 1B50733-1, S/N 56553, was bent.	The transducer was scrapped.
165	A192036 5-31-66	The forward dome external mylar insulation was debonded approximately 50 per cent.	Acceptable to Engineering for use.
166	A192037 5-31-66	Transducer 410MT601A had an erratic output.	The transducer was tested per B/P 1B70338B, and accepted for use.
167	A192039 6-1-66	Open resistance readings were noted from temperature patches 401MT643-C149 and 401MT640-C146, P/N 1A68589-517.	The patches were removed and replaced with new parts per B/P.
168	A192040 6-1-66	Temperature probe 405MT743-C275, P/N 1B50733-1, showed open resistance reading.	The probe was removed and replaced with a new part per B/P.
169	A192042 6-2-66	Pressure transducer 403MT604, P/N 1B31356-503, S/N 245-2, dropped approximately 100 psi during static firing.	After retest per B/P 1B49276, the transducer was still defective, and was returned to the vendor for rework per spec.
170	A192043 6-3-66	Pressure transducer, P/N 593-2, S/N 22993, internal wiring showed leakage to the transducer case.	The transducer was returned to the vendor for replacement.
171	A192044 6-3-66	One leg of the strain gauge of pressure transducer 401MT1004, P/N 592-4, S/N 23060, was open.	The transducer was returned to the vendor for replacement.
172	A192046 6-3-66	Solenoid valve, P/N 1B26964-501, S/N 56495, in the thermal conditioning unit, did not open on command.	The valve was returned to the vendor for rework to specs.
173	A192127 6-2-66	On APS module two, temperature transducers, P/N 1A68589-509, S/N's A681 and A738, read open. Should have read 217 ± 10 ohms when	The transducers were returned to the vendor for replacement.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
173 (Cont.)	A192127 6-2-66	installed in the system. The defect was noted while testing per H&CO 1B6C951NC.	
174	A192177 6-8-66	Readout from temperature sensor 408MT621, P/N 1A67862-513, S/N 407, was 5 per cent high.	The sensor was retested and acceptable for use.
175	A192180 6-9-66	Temperature transducer 408MT662, P/N 1A68589-521, had two 1/16 in. x 1/2 in. air bubbles in the narmco potting.	Acceptable to Engineering for use.
176	A192183 6-10-66	Insulation, P/N 1B38694-501, was broken.	The insulation was scrapped.
177	A192184 6-10-66	Chilldown pump insulation, P/N 1B38695-501, was broken.	The insulation was scrapped.
178	A192185 6-10-66	Chilldown pump insulation, P/N 1B38511-501, was broken.	The insulation was scrapped.
179	A192192 6-14-66	Cable assembly, P/N 1B53574-7, S/N 501-1, to LH_2 chilldown pump insulation was damaged 18 in. from the connector.	The damaged area was repaired per DPS 1.357-15. The rework was acceptable.
180	A192194 6-14-66	The following defects were noted on strain gauge harness 427MT679-680, P/N 1B54074, S/N 00001: a. Resistance between pins C and G and pins C and F was open, should have been 120 ohms. b. Splice SP1 was open.	The gauge was respliced per B/P. The resistance measurements were rechecked and found satisfactory.
181	A192197 6-15-66	The aft environmental purge membrane was debonded at stringers 5 through 11, 40, 44 to 45, 49 to 50, 63, 68, 90 through 93, 108, 57 to 58, and 70 to 76. Leakage was indicated.	The areas of leakage were sealed with a sealing bead of gap filler per DPS 2.3003. The rework was acceptable.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
182	A192199 7-15-66	High pressure charging valve, P/N 1B31275-1, on reservoir accumulator assembly, P/N 1B27319-513-006-013, S/N 00001, had the stem broken off.	The stem was removed and replaced per B/P. The rework was acceptable.
183	A192376 5-17-66	Pressure transducer 424MT617-NASA D0062, P/N 1B40242-507, S/N 507-3, read 12 psi at ambient.	The discrepancy could not be duplicated when tested per B/P 1B70338, and the transducer was acccptable for use.
184	A197104 6-10-66	In pressure transducer, P/N 1A68551-551, S/N 158-39: a. Potentiometer resistance was 4726.3 ohms; should be 5000 ± 250 ohms. b. Linearity was 2.76 per cent of full scale; should be ± 80 per cent of full scale.	The transducer was scrapped.
185	A197286 6-17-66	Acoustic pick-up unit, P/N 1A68708-507, S/N 351, would not calibrate on measurements B17 and B18, and was off scale on the high side before firing.	The unit was returned to the vendor for rework to applicable specs.
186	A197290 6-21-66	Valve, P/N 1B51753-501, S/N 00001, would not regulate per B/P. The problem was observed while testing per H&CO 1B55840 NC.	The valve was reworked per SEO 1B51753-004.
187	A197411 7-1-66	Module strain bridge units 404A60A230 and 404A60A236, P/N 1B55754-513, S/N's 00132 and 00129, would not calibrate for low or high racs.	The discrepancy was confirmed per B/P 1B55754. The module was routed to A plant for further checkout.
188	A197424 7-19-66	On multiplexer, P/N 1B29741-563, S/N 00001, pin V of plug J-4 was bent 45°. This defect was discovered while testing per H&CO 1B55840.	The pin was straightened and the plug connected.

TABLE I, Section I (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
189	A204802 7-20-66	Pressure transducer 424MT600, P/N 1B43324-537, S/N 031-1C, read 40 psi at ambient.	The transducer was returned to the vendor for replacement.
190	A204804 7-20-66	Pressure transducer 4014MTP59, P/N NA5-27316 T5T, S/N 2889, removed and replaced per FARR A204835, was determined to be open upon resubmit.	The transducer was returned to the vendor for rework or replacement.
191	A204833 7-28-66	Upon removal of pressure transducer 410MT600 per FARR A197425, it was noted that both the transducer and tube assembly, P/N 1B43400-1-001, had metal chips on the inside surface. A brown liquid was also noted.	The end plate covering at the transducer mounting location was removed and cleaned.
192	A204835 7-28-66	Pressure transducer 4014MTP59, P/N NA5-27316 T5T S/N 2889, read ambient, rather than 1.149, at low RACS. This defect was noted during testing per H&CO 1B55840.	The transducer was removed and replaced per B/P. FARR A204804 notes further disposition.
193	A209979 5-23-66	Destruct controller 411A97A19, P/N 40M32016-1, S/N 2B239, had out-of-tolerance resistance measurement on connector J4, pin K to ground. Measured resistance was 30 K, should have been 5 K.	The controller was completely retested per B/P 1B53614 and accepted by Engineering for use.

TABLE I (Continued)

Section 2. Space Systems Center, Vehicle Checkout Laboratory

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
194	A174424 1-25-66	Relief valve, P/N 1A66243-501, S/N 06177-2, on reservoir, P/N 1B29319-513-006A, S/N 00001, leaked when a hydraulic pressure of 1000 psig was applied. This leak was discovered during testing per H&CO 1B62519.	The valve was removed and replaced, and with the new valve the reservoir assembly successfully passed a leak check.
195	A174426 11-30-65	Connector 404A3W1-P7 of wire harness, P/N 1B50159-1, S/N 00002, had insert arrangement rotated 180°.	Plug P7 was removed and replaced.
196	A174427 11-30-65	On module 404A73A201, P/N 1A98042-1, S/N 00028, pin P of connector J4 was bent 20° from normal. Defect noted during continuity compatibility check, H&CO 1B44541.	The pin was straightened per DPS 1.357-3 PEO.
197	A174428 11-30-65	The insert of connector 404W219P8 of wire harness, P/N 1B44907-1, S/N 00002, was punctured near contacts P and S. This connector mated to module 404A73A201 in the aft skirt area. Defect noted during continuity compatibility check, H&CO 1B44541.	The condition was acceptable to Engineering for use.
198	A174429 12-7-65	Module 404A3A39, P/N 1B39975-1, S/N 00039, had a discontinuity between pins J2G and J1I.	Acceptable to Engineering for use.
199	A174433 1-12-66	In control unit, P/N 1A68710-511, S/N E-58, a relay activated and deactivated at random when capacitance was decreased. It should have remained deactivated until voltmeter indicated 0 ± 1.1 VDC. Resubmit 1: It was found that the potentimeter adjustment was inaccurate. After proper adjustment the relay performed properly.	Retest and resubmit. Resubmit 1: Acceptable to Engineering for use.

TABLE I, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
200	A174435 1-13-66	Wire harness 411A94A61A229, P/N 1B52350-1C, S/N 8479, had insulation and strands cut on wire D2592A-22-WHT at P22.	The damaged wire was removed and replaced.
201	A174436 1-14-66	Wire harness 404W30, P/N 1B56371-1, S/N 00001, had the inner conductor and shield of wire Q9056B shorted between pin 5 of plug P6 and pin C of plug P1.	Plug P6 was removed and replaced and the wire harness accepted by Engineering for use.
202	A174437 1-15-66	Multiplexer 411A96A200, P/N 1B55251-511, S/N 00002, had an output of 2.495 volts on subchannels 1 through 10 of channel 2, with an input of 3.75 volts. Output should have been 3.75 $\pm$ 0.025 volts. Defect noted during systems test, DDAS calibration, H&CO 1B55792.	Retest per B/P 1B37743 was accomplished without repetition of the problem. Running time was noted as 3.5 hours. The unit was acceptable to Engineering for use.
203	A174438 1-15-66	Wire harness 411A92A25J1, P/N 1B56380-1, had coaxial pin 11 of plug P10 recessed. Also, the outer metal shielding of pin 11 was bent inboard. These defects were discovered during final acceptance testing.	Pin 11 was removed from plug P10 and replaced. It was accepted by Engineering after retest.
204	A174439 1-15-66	Control unit, P/N 1A68710-509, S/N E-86, had erratic output voltage when a 5 VDC input was applied. Voltage output would not decrease to 0.0 VDC.	Acceptable to Engineering after the unit had been retested to the procedure with no repetition of the problem.
205	A174441 1-17-66	Wire harness 404W7, P/N 1B50045-1, had pin A recessed in plug P33. The defective part was located in the aft dome at the thrust structure.	Plug P33 was removed and replaced.
206	A174442 1-17-66	In wire harness 404W209, P/N 1B44906-1, S/N 00001, the inner conductor and shield of wire D5337A22 were shorted between pin 10 of plug P22 and pin 12 of plug P15.	Pin 12 of plug P15 was removed and replaced. The wire harness assembly was then accepted by Engineering for use.

TABLE I, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
207	A174444 1-17-66	The output from control unit 411A91A66A225, P/N 1A68710-509, S/N E-105, would not increase to 5 VDC when R-1 was adjusted, but remained at 0.0 VDC. The unit failed retest and the potentiometer was not out of adjustment.	The unit was reworked to blueprint, and accepted by Engineering for use.
208	A174445 1-19-66	A sawtooth output resulted when voltage was applied to multiplexer, P/N 1B55251-525, S/N 00002. A square wave output should have resulted.	Acceptable to Engineering for use.
209	A174446 1-19-66	The following defects were discovered on the forward skirt and dome: a. Wire assembly 411W279, P/N 1B50197-1, S/N 00001, had a dead short between the inner contact and the wire shield contact. b. The coaxial outer contact barrel of the same assembly was cracked around the edge.	a. Defective pin 11 in plug P-14 was removed and replaced. b. Outer contact barrel was removed and replaced.
210	A174447 1-20-66	The following defects were noted during the aft skirt thermo-conditioning system purge, H&CO 1B40550: a. There was excessive leakage around the APS seal plates at stringers 71 to 73 and 143 to 145. b. There were seven rivets omitted at stringer 88. c. There was excessive leakage at skirt attach points at stringers 7 to 8. d. There were leaks around valves at stringers 120 and 121. e. There were leaks around fuel ducts, stringers 125 to 129.	a. Tooling clamps were relocated to eliminate leaks. b. Attachments were installed per B/P. c. Leaks were sealed with sealant, P/N MIL-S-8802-4. d, e, and f. Leaks were sealed with sealant, P/N 501.

TABLE I, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
210 (Cont)	A174447 1-20-66	f. At stringers 140 to 142, approximately 8 in. of diaphragm was loose inside the skirt. There were numerous leaks around the diaphragm.	
211	A174448 1-22-66	EBW pulse sensor, P/N 40M02852, S/N 0158, worked intermittently during test per H&CO 1B55796.	Accepted by Engineering for use, due to readjustment during retest.
212	A174449 1-24-66	Transducer, P/N 1B50733-1, S/N 56161, measured open between pins A and B.	The transducer was returned to the vendor for replacement, and a substitute unit was installed.
213	A176828 12-21-65	a. At thrust structure stringer 18, in wire harness 404W7, wire 10P34A20 WHT, type 3J, had a cut 3 in. back of connector P36, P/N MS3116E-8-4P. b. At the customer connect panel, connector J3 of wire harness, P/N 1B44901-1, had the insert punctured next to contact small x.	a. The connector was removed and reinstalled short of the damaged area. b. The connector was removed and replaced by an undamaged item per B/P.
214	A184701 1-26-66	Relief valve, P/N 1A66243-501, S/N 06177-2 leaked at the labelled end at a 1000 psig hydraulic pressure.	The valve was returned to the vendor for rework per B/P.
215	A184702 1-27-66	There were surface scratches on the flare seat of fitting, P/N 1A83354-501, causing an oil leak.	The fitting was removed and replaced.
216	A184703 1-27-66	There were surface scratches on the flare at both ends of pipe assembly, P/N 1B39774-1.	The flares were polished out with No. 400 paper per DPS. The rework was acceptable.

TABLE I, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
217	A184704 1-27-66	There were surface scratches on the flare at one end of pipe assembly, P/N 1A39778-1.	The flare was polished using No. 400 paper per DPS. The rework was acceptable.
218	A184706 1-27-66	There were surface scratches and excessive leakage at both ends of pipe assembly, P/N 1B39783-1.	The flares were polished per DPS. The rework was accepted.
219	A184707 1-28-66	There were surface scratches on the flare seat of fitting, P/N 1A83354-501.	The fitting was scrapped.
220	A184710 2-1-66	It was impossible to adjust R6 on temperature module, P/N 1A82274-515, S/N 01064, to 0.0 VDC per H&CO 1B44547. Reading was 5.593 VDC.	R6 potentiometer was found to be open. The part was scrapped.
221	A184711 2-1-66	The output of module, P/N 1B39022-1, S/N 00001, was 0.861 VDC, and could not be adjusted to the required 1.000 $\pm$ 0.005 VDC using adjustment R2.	The module operated satisfactorily on retest and was acceptable to Engineering for use.
222	A184712 2-1-66	PCM/DDAS assembly, P/N 1A74049-513, S/N 00001, caused random failures in the B0, A1, and A2 multiplexers during the DDAS Calibration per H&CO 1B55792. The outputs of various sub-channels and channels were below tolerance.	The PCM/DDAS assembly was retested and found to be operating satisfactorily. The noted random failures were attributed to inherent system noise. The unit was acceptable to Engineering for use.
223	A184714 2-1-66	The electrical switch on valve, P/N 1A49965-509, had continuity between pins E and F, rather than between pins D and E, in the open position.	The disposition on this FARR was outlined on FARR A188029.
224	A184715 2-2-66	There were leaks in the hydraulic system at the following locations: a. The downstream end of pipe, P/N 1B39783-1A.	The disposition on this FARR called for the removal and replacement of both noted flex lines. However, FARR A188038 was written to reflect rework

TABLE I, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
224 (Cont)	A184715 2-2-66	b. At the connection between pipe, P/N 1B39772-1A, and flex line, P/N 1A88155-1NC. c. At the connection between flex line, P/N 1A88154-1NC, and the yaw actuator. The leaks were discovered during checkout per H&CO 1B62519 NC.	on the hydraulic system at STC, and superseded this FARR.
225	A184716 2-2-66	The insulation was cut for a 1/16 in. X 1/16 in. area on wire Q9052A22 of wire harness 411W11P13, P/N 1B56380-401, exposing the shield, approximately 3 1/2 in. from the plug.	Acceptable to Engineering for use.
226	A184717 2-2-66	Between stringers 143 and 1, and 71 and 73, stations 240 to 270, the seal, P/N 1A87429-505, used to seal APS units, was badly cut or damaged in several places.	The seal was removed and replaced. The rework was accepted.

TABLE I (Continued)

Section 3. Assembly and Systems Installation

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
227	A123167 1-11-65	Twenty-six No. 30 holes in channel, P/N 1B31408-3, and twenty-six No. 30 holes in channel, P/N 1B31408-5, would not align with No. 40 pilot holes in web, P/N 1B31408-7.	New holes were drilled in the web to align properly with the channels. Rivets, P/N MS20470AD4, were installed, and excess holes were left open. The rework was acceptable.
228	A147193 8-31-65	a. Several J-2 engine installation and purge lines rode one another above the LOX turbine. b. There were dents in the interior of the thrust chamber area, tubes 530, 491, and 496.	a. PU line blocks were readjusted to avoid riding. b. Acceptable to Engineering for use.
229	A159442 2-11-66	At stringers 71, 72, and 73, the seal, P/N 1A87429-503, had a 4 in. cut at the top.	The seal was removed and replaced. Rework was acceptable.
230	A168782 12-21-65	Temperature sensor 409MT674, P/N 1A68589-509, S/N 7814, had an open grid after installation.	Not acceptable to Engineering, sensor removed and replaced.
231	A168974 11-6-65	The insulation on wire 3SJ was cut 1/2 in. below clamp 107, exposing the shield.	Acceptable to Engineering following rework.
232	A174105 11-17-65	Fitting assembly, P/N 1A57487, had three 0.010 in. deep by 0.187 in. long gouges in the upper right hand counterbore area, and a 0.020 in. deep half-moon gouge in the lower left hand counterbore area.	The damaged counterbore areas were spotfaced to remove the gouges.
233	A174107 11-19-65	LOX fill line, P/N 1A69044-1, and various lockbolts, braces, and miscellaneous hardware, showed evidence of corrosion, discoloration, and tape residue.	With cleanliness maintained per DPS 43110, the corrosion, discoloration, and tape residue were removed per Engineering rework instructions, and the areas were alodined. After two reworks, the defects were removed and the areas were accepted for use.

TABLE I, Section 3 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
234	A174151 11-17-65	The outer insulation of wire harness, P/N 1B44923-1, was cut through in numerous places.	The wire insulation was repaired per DPS 1.357-15 to an acceptable condition.
235	A174160 11-19-65	Wire harness 403W5 had four wires with damaged insulation and one coaxial cable with the shield showing.	Defective areas were wrapped with teflon tape per DPS 1.357-15.
236	A174165 11-23-65	The screws, P/N NAS 1403, used to attach modules to signal conditioning racks, P/N's 1B28827-571, -575, and -577, had short thread engagements in the delron inserts at seven places.	On rack, P/N 1B28827-577, the screws were replaced by screws, P/N NAS 1403-32. At the other locations, the condition was acceptable for use.
237	A174172 10-30-65	The Handling Kit Transport procedure, H&CO 1A5785, required 53 bolt holes for attaching the GSE ring; only 48 holes were provided.	The GSE ring was connected to the skirt attachment ring at the provided holes, and by 2 additional bolts, P/N NAS 1105, through bushings added between stringers 43 and 44, and 118 and 119.
238	A174178 11-18-65	Holes for a tube support were mislocated on panel mount, P/N 1B55543-1.	The holes were elongated to 0.260 in. Rework was acceptable.
239	A174430 12-14-65	In the aft skirt area, wire harness, P/N 1B50213-1, had the rubber insert punctured at 2 places near pins R and C.	After a megger check, the item was found acceptable to Engineering for use.
240	A176841 1-7-66	Gusset, P/N 1A87755-11, was 82°. It should have been 90° per B/P 1A87755. Also, the 1/8 in. dimension was 1/4 in. at the toe. This prevented the installation of brackets per B/P 1B37688.	A 7075-T6 aluminum alloy filler was installed between gusset and bracket, P/N 1B37688-9, to compensate for the out of tolerance installation. Existing attachments were picked up, and the rework was accepted.

TABLE I, Section 3 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
241	A176846 1-9-66	Wire harness 404A691N200 had 2 holes in outer jacket of shielded wires.	Acceptable to Engineering for use.
242	A184311 1-19-65	On the forward skirt, adapter, P/N 1B33367-1, had two splits about 1 in. long adjacent to the top of the feedthrough.	Acceptable to Engineering for use.
243	A184628 1-28-66	a. Wire assembly 427MT604A to transducer, P/N 1A68707-525, S/N 254, hit the structure at the connecting point, preloading the connector. b. Wire assembly 427 MT605A to transducer, P/N 1A68707-525, S/N 334, hit the structure at the connecting point, leaving insufficient bend radius clearance. c. Wire assembly 427MT604B to amplifier, P/N 1A68707-525, S/N 254, had unbonded molded connector insulation.	Acceptable to Engineering for use.
244	A188670 2-25-66	a. Pipe assemblies, P/N's 1A92854-1, 1A92858-1, 1A92856-1, 1B55280-1, and 1B32913-1, were overwrapped. b. Due to this overwrapping, the pipe assemblies were not installed properly in blocks per B/P's 1A66894 and 1B58003.	a. Acceptable to Engineering for use. b. Areas were rewrapped and secured in blocks with MIL-T-22742 tape. The rework was acceptable.

TABLE II. FAILURE AND REJECTION REPORTS, STRUCTURAL ASSEMBLIES

Section 1. Propellant Tank Assembly, P/N 1A39303-503

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
1	A114498 12-18-64	During the cool down cycle, a total loss of vacuum occurred. The tensile specimens were successfully tested per DPS 1.964.	Acceptable to Engineering for use.
2	A122262 1-4-65	Bonding operations did not meet the requirements of DPS 1.964, as follows: a. Between 230°F and 240°F, the T/C readings did not stabilize within 5°F. b. During cure, the differential between thermocouples was 8°F, should have been 330°F ± 1/2°F. c. During cool, there was a differential of 14°F between thermocouples, should have been 5°F.	After tensile test results were submitted, the condition was accepted by Engineering for use.
3	A133498 3-27-65	The forward dome was rotated 1/8 in. out of tolerance in relation to the LH_2 tank shell. The dome was properly located with respect to prick punch marks and the scribe line on AJ-1, however, the LH_2 shell was located 5/32 in. off. Maximum tolerable deviation from prick punch marks was 1/8 in. per QEC 725.	Acceptable to Engineering for use.
4	A133555 4-5-65	There was a mismatch of 0.060 in. to 0.062 in. between the aft skirt attach angle and the LH_2 skin. Maximum mismatch allowable per B/P 1A39303 was 0.010 in.	Acceptable to Engineering for use.
5	A139752 5-26-65	There was black discoloration scattered in the V-block area where common bulkhead joined the aft dome. The discolored area was on the LH_2 tank side of the assembly.	Area was sanded and treated with Lefkoweld primer.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
6	A139754 5-24-65	Base radius of probe support assembly, P/N 1A57821-1, interfered with nut and washer installation at attach studs in LH_2 tank on aft segment 5.	Washers were trimmed off to avoid riding in the radius of the support. The rework was acceptable.
7	A139758 5-25-65	Seven LH_2 tank probe attach brackets had attach holes elongated from 0.010 in. to 0.058 in.	Acceptable to Engineering for use.
8	A139759 5-25-65	Attachment stud in bracket, P/N 1B37283-1, failed where the stud intersected the tank parent material, resulting in a 0.335 in. diameter cavity in the parent metal.	The stud was replaced after the area was cleaned with a wire brush.
9	A139761 5-28-65	Fitting, P/N 1B43610-502 was mislocated 0.038 in., and fitting, P/N 1B43610-501, was mislocated 0.028 in., per B/P 1B43528 "A", zone 6, view B-B. Maximum B/P tolerance was 0.010 in.	Acceptable to Engineering for use.
10	A139764 6-4-65	Balsa ring, P/N 1A89421-1, was incorrectly installed at the base of probe support in LH_2 tank segment 8. Sections of two sides were mismatched 3/16 in., and adjoining tiles were out of contour, indicating bonding surface was not properly pre-fit.	The balsa ring was removed, and a new one pre-fit and installed. The rework was acceptable.
11	A139767 6-9-65	The following insulation defects were discovered at aft segment 8, LH_2 tank: a. Adhesive weights were not maintained at 0.09 to 0.11 pounds per DPS 3.429. b. Balsa pads in V area were run under the Lefkoweld spreader. Also, the pads did not conform to weight requirements per QEC 796.	Both conditions were acceptable to Engineering for use.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
12	A139771 6-21-65	Twelve baffle installation balsa pads, P/N 1B56154-1, were installed with a hand mixed adhesive. No weight control tests, tensile tests, first, or final flow checks were conducter per DPS 3.429.	Acceptable to Engineering for use.
13	A139772 6-23-65	3D insulation tiles in the LH_2 tank, aft dome segments 8 and 9, and forward dome segments 2, 7, and 8, failed adhesive bond tensile test per DPS 3.429. Neither the minimum individual value of 100 psi, nor the minimum group value of 150 psi was achieved.	Forward dome segment 8 was acceptable as is. On the others, the tiles were removed, the adhesive stripped, and tile pre-fit and rebonded per DPS. The rework was acceptable.
14	A139773 6-24-65	During the adhesive tile bonding cure cycle, vacuum pressure was maintained at 13 H.G. for a time period of thirteen hours, extending from 1 1/2 hours after vacuum application until cure completion. Minimum allowable pressure was 15 H.G. per DPS 3.429.	After a review of coupon test results, the condition was deemed acceptable to Engineering for use.
15	A139774 7-2-65	Adhesive tensile specimen, S/N 31, representing sixteen baffle balsa pads installed in center segment 3, failed to meet the DPS requirements of 100 psi minimum for individual coupons, and 150 psi minimum for a group. Results for the five were 73, 124, 140, 248, and 101 psi, with an average of 137 psi.	Acceptable to Engineering for use.
16	A139775 7-7-65	Glass liner tensile specimens, representing cylindrical segments 5 and 1 of the interior of the LH_2 tank, failed adhesive bond tensile test per DPS 3.429. Average values in segments 5 and 1 were 130 psi and 121 psi respectively. Minimum allowable group average was 150.	Acceptable to Engineering for use.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
17	A139990 5-7-65	The exterior skin surface of aft dome segments 2, 3, and 4 was pitted over the entire area of the three segments.	Acceptable to Engineering for use.
18	A139998 5-22-65	Between weld seams 5 and 6 of the aft dome one of each of supports, P/N's 1B37762-1, and 1B37763-1, on either side of the LOX vent port, had unbonded tabs.	The supports were removed and replaced per DPS 1.606.
19	A147087 7-27-65	Maximum relative humidity of 65 per cent was exceeded to 73 per cent during adhesive bond cure cycle on LH_2 tank insulation tiles. Several segments in the forward dome, tunnel area, and aft dome were affected.	After test results were submitted, some main tunnel area tiles required removal and replacement. All others were acceptable as is.
20	A147091 7-1-65	Two supports on the aft dome between weld seams 1 and 2 were misidentified as P/N's 1B27099-8. These parts were not to B/P 1B27099G.	Spacers were installed to compensate for trimmed legs of supports, and the rework was accepted.
21	A147092 7-1-65	Maximum relative humidity of 65 per cent was exceeded to 84 per cent for a twenty minute period during adhesive bond cure cycle on several main tunnel area segments.	Acceptable as is except for jobs 200, 202, 206, 210, and 224, chart 15402, on main tunnel area. Tiles and assemblies affected by these jobs were removed and replaced. This rework was accepted per FARR A154415.
22	A147093 7-3-65	Maximum relative humidity of 65 per cent was exceeded to 73 per cent for a twenty-five minute period during adhesive bond cure cycle on forward dome, main tunnel, and aft dome segments of the propellant tanks.	All areas except five segments in the main tunnel section were acceptable as is. Tiles in unacceptable areas were removed and replaced per FARR A154415. The rework was acceptable.
23	A147094 7-5-65	During the first adhesive cure cycle on job 211, the minimum allowable ambient temperature of 65°F was exceeded to as low as 60°F for 28 1/2 hours.	After review of coupon tensile test results, the condition was accepted by Engineering.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
24	A147095 7-6-65	During the first adhesive cure cycle for job 203, the minimum allowable ambient temperature of 65°F was exceeded to as low as 58°F for a total of 4 1/2 hours.	After review of coupon tensile test results, the condition was accepted by Engineering.
25	A147096 7-6-65	During the first cure cycle for the adhesive bonding adhesive tiles to tank segments, the minimum allowable temperature of 65°F was exceeded to as low as 58°F over a 2 1/2 hour period.	Acceptable to Engineering after a review of coupon test results.
26	A147097 7-6-65	During the first adhesive cure cycle for job 216, the minimum allowable ambient temperature of 65°F was exceeded to 63°F for 1 1/2 hours.	After a review of coupon tensile test results, the condition was accepted by Engineering.
27	A147098 7-6-65	During the first adhesive cure cycle for job 224, the minimum allowable ambient temperature of 65°F was exceeded to 63°F for 1 1/2 hours.	After a review of coupon tensile test results, the condition was accepted by Engineering for use.
28	A147099 7-7-65	The maximum allowable relative humidity of 65 per cent was exceeded to as much as 78 per cent for a twenty minute period during adhesive bond cure cycle for propellant tank 3D tiles. Forward dome, main tunnel, and aft dome areas were involved.	Certain main tunnel area tiles were removed and replaced per FARR A154415. All others were acceptable as is.
29	A147100 7-7-65	Maximum allowable relative humidity of 65 per cent was exceeded to 78 per cent for a twenty minute period during adhesive bond cure cycle on several forward dome, aft dome, and main tunnel areas in the propellant tanks.	Some 3D tiles in the main tunnel area were removed and replaced per FARR A154415. All others were accepted as is after review of coupon test results.
30	A154408 8-3-65	The elevated cure cycle of adhesive bonding 3D tiles to tank frame was not completed within 65 days after the start of the first cure cycle per DPS 1.606.	Acceptable to Engineering after review of coupon test results.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
31	A154415 8-16-65	Nine areas in the main tunnel failed coupon tensile test on adhesive bonding 3D tiles to the tank frame per DPS 1.606.	Six areas were acceptable as is. The others required removal and replacement of clips and standoffs per DPS.
32	A154417 9-1-65	At forward dome weld seam 3, support assemblies, P/N's 1B26854-1, 1B37888-533, and 1B37889-541 NC, bond line showed discoloration and possible contamination.	Acceptable to Engineering for use.
33	A154501 7-12-65	Adhesive tensile test specimens, S/N's 37 and 38, failed test per DPS 3.429. S/N 37 failed both individual and group average requirements. Coupon 1 of S/N 38 measured 73 psi, below the 100 psi minimum.	3D tiles were removed, the adhesive was stripped, and the tiles were pre-fit and bonded per DPS. The rework was acceptable.
34	A154502 7-19-65	Tensile test specimen, S/N 131, representing aft dome segment 9, failed coupon tensile test per DPS 3.429. Test results showed average of 125 psi, and a minimum individual result of 97 psi. Allowable minimums were 150 psi for the average, and 100 psi for individual specimens.	Acceptable to Engineering for use.
35	A154503 7-21-65	Glass liner tensile specimen, S/N 139, was not submitted for testing because approximately 50 per cent of the liner was unbonded on both sides of the specimen.	After review of coupon test results for area immediately adjacent, the condition was considered by Engineering to be acceptable for use.
36	A154504 7-23-65	Gap filler, used in the installation of tile glass liner stop off seams in the cylindrical section of the tank, was soft at seams 5 and 6.	After reviewing coupon tensile test results, Engineering accepted the condition for use.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
37	A154506 7-26-65	Balsa pad ring around the LH_2 feed outlet was not properly prefit, and did not nest down to the bottom of the recess for balsa to metal bond. The situation had been reworked by the addition of an undetermined amount of Lefkoweld sealant through the pad, and sanding down mismatched upper surface.	Acceptable to Engineering for use.
38	A154507 7-26-65	Liner, P/N 1A78175-3, in the cylindrical section of the tank, extended over balsa pad, P/N 1B56154-1, to fitting, P/N 1B55745-1. Per B/P 1A78175, liner should have extended only 1 $\pm$ 1/4 in.	Acceptable to Engineering for use.
39	A154509 7-31-65	Five tensile test specimens, S/N 59, had bonding parted under exposure to LN_2.	Acceptable to Engineering for use.
40	A154510 7-31-65	The following defects pertain to the LH_2 tank insulation installation: a. There were small bits of metal foil or polyethylene under tiles 10 to 30 of forward dome segment 4, numerous tiles in forward dome segment 9, tile 280 of cylindrical tank segment 2, and tiles 293-294 of cylindrical tank segment 4. b. There was excessive gap filler around probe fitting at tile 19 of forward dome segment 6. c. There was excessive liner overlining balsa pad at circumferential stopoff, aft dome segment 5.	All conditions were acceptable to Engineering as is.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
41	A159551 8-24-65	An unauthorized angle was installed on top of P/N 1B32899-5 to pick up attachments through P/N 1B34043-1. This was not per SEO 1B31289-003.	Acceptable to Engineering for use.
42	A159573 10-1-65	a. There was a cut in the skin of the forward dome, where the tile was trimmed for doubler rework. b. Balsa ring, which should have been trimmed per B/P 1B59281 view A zone 4, was removed completely. c. An extra 3 in. X 9 in. section of tile was removed near weld seam 5 inside the LH_2 tank.	a. The cut was a scratch, and was deburred, but otherwise accepted as is. b and c. Missing parts were installed per B/P and DPS 3.429. All rework was acceptable.
43	A163057 10-1-65	Five doublers, P/N 1B59281-5, were mislocated, with the result that if holes had been drilled for attachments per B/P, they would have had short edge distance to weld seams 5 through 9.	At seam 5, the hole was pulled 0.060 in. from the seam, and the drill mark covered. At seams 6, 7, and 8, hole centers were relocated 1/4 in., and drill marks were blended out. At seam 9, the hole was acceptable as is. All rework was satisfactory.
44	A168933 10-19-65	X-ray 65-41 revealed two washers embedded in the insulation or between doublers and the dome flange. Resubmit: Re-X-ray showed the washers were on the outside, between the doubler and the dome flange.	The area was re-X-rayed at an angle to determine the location of the washers, and resubmitted. Resubmit: Acceptable to Engineering for use.
45	A168959 10-26-65	Tensile test coupons 500 and 502 measured 875 psi minimum, should have been 900 psi minimum per DPS 32330, paragraph 8.1.	Acceptable to Engineering for use.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
46	A168960 10-28-65	Dew point reading was not taken at time of closure of LH_2 tank.	Purge of the LH_2 tank per DPS 43110 was required if the dew point was above 32°F. After measurement of the dew point, the tank condition was acceptable.
47	A168962 11-1-65	The tank assembly debris shroud was not joined at a splice as required. Also, nine splices were located out of circumferential tolerance.	Both conditions were acceptable for use without rework.
48	A174107 11-19-65	There was evidence of acid rust and white powdery residue throughout the interior of the LOX tank.	After all areas were carefully cleaned, tested with pH paper and necessary parts replacements made, the reworked areas were accepted by Engineering for use.
49	A176847 1-10-66	One wire at the forward dome temperature probe feed thru had the outer jacket damaged, exposing the shield. The wire was for a liquid level sensor C1.	Acceptable to Engineering for use.
50	A184534 2-5-66	On the LH_2 tank insulation liner: a. Forward dome segment 3 had insufficient bolt head seating clearance, and the liner was not sealed to the sides of the probe attachment fitting ears. b. The aft end of segment 5 had discoloration forward of the balsa ring liner between pads 230 and 231. c. Tile 222 at the center of segment 3 had a 3 X 3/4 in. area where the liner was not bonded to the side of a probe support fitting. Also, there were three cuts on the edge of the fitting.	a. The insulation was trimmed to provide clearance, and glass cloth liner was installed over the exposed balsa per DPS 23003. b. The discoloration was acceptable for use. c. The liner was bonded with DPM 3396 ad adhesive per DPS 23003. The cuts were acceptable without rework. d. The punctured areas were filled with gap filler prepared per DPS 23003.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
50 (Cont)	A184534 2-5-66	d. The liner was punctured through tile 328 of center segment 6 and tile 268 of center segment 7. e. Linear voids and debonded areas were noted at various tiles on center segments 3, 4, 5, and 7, and forward segment 5.	e. The defect areas were repaired to comply with DPS 23003.
51	A188334 2-7-66	Numerous void areas extended under the tape fastener, P/N 1B56518-5, around the entire circumference of the tank insulation, contrary to DPS 32340 requirements.	High spots were removed with a plastic scraper where possible, and adhesive, P/N 1P20023, class I, was injected into the voids per DPS 32340. After a 24 hour cure at room temperature, the rework was acceptable for use.
52	A188477 2-7-66	a. The retainer patches on the wires of sensor, P/N 1A68589-505, had void areas next to the wires, extending into the bond line, for the width of the patch. b. Retainer patches were not installed 2 in. from the sensors as required by B/P 1B42487.	a. The void areas around the wires were filled with No. 109 Lefkoweld adhesive per DPS 1.603, and cured to a shore hardness of 90. b. The condition was reworked to meet B/P requirements.
53	A188478 2-7-66	On strap assembly, P/N 1A39297-1, of helium bottle B on bank 2, the jamb nut had brown oxidation covering the full surface, and the turnbarrels had the silver plating flaking off and showed evidence of corrosion.	The installed jamb nut was the wrong type and was replaced. Corrosion and loose plating was removed from the turnbarrels per Engineering instructions.
54	A188485 2-11-66	a. Segment assemblies, P/N's 1B56516-3 and -5 were 41 in. long, should have been 45 7/32 in. per B/P. b. There had been an unauthorized removal and reinstallation of wire runs A and B of cable 408W200, in the area of deflector assembly, P/N 1B56516-1.	a. The segments were reworked per salvage SEO 1B56518-002. b. The wire run installations were reworked to meet B/P requirements.

TABLE II, Section 1 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
54 (Cont)	A188485 2-11-66	408W200, in the area of deflector assembly, P/N 1B56516-1.	
55	A188486 2-11-66	Acid burn from pasa-jell, P/N DPM 1571, was visible on several insulation tiles in the cylindrical tank and forward dome areas.	The areas were cleaned, the affected tiles removed, and the Lefkoweld removed from affected areas on the skin. The areas were primed and the Lefkoweld liner and tiles were replaced per DPS. The rework was acceptable except for areas covered on FARR 188489.
56	A188489 2-15-66	After rework per FARR 184486, excess liner was found to have been removed on several tiles in cylindrical segment 3.	Lefkoweld was applied, and the areas were relined per DPS and tested satisfactorily for hardness. The rework was acceptable.
57	A188673 2-25-66	a. Support assembly, P/N 1B51014-9, was mislocated 0.150 in. toward the angle of the helium bottles, causing a preload condition on manifold assembly, P/N 1A68668-501. b. Support assembly, P/N 1B51014-7, was mislocated 0.200 in. toward the angle of the helium bottles, causing the same condition.	Brackets, P/N 1B37448-1, were trimmed. A channel, P/N 1B37147-004-3, was fabricated and installed on each support. The rework was acceptable.

TABLE II (Continued)

Section 2. Forward Dome Assembly, P/N 1A39304-503

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
58	A118523 11-5-64	Contour inspection revealed: a. Flange, P/N 1A66104-501, was out of round. Was 0.015, should be 0.010 maximum. b. Flange, P/N 1A66104-501, was out of flat. Was 0.013, should be 0.010 maximum. c. Mismatch of 0.040 in. between segments 3 and 4, to flange, P/N 1A66104-501, should be within 0.040.	Acceptable to Engineering for use.
59	A120071 12-17-64	Dye check of the EE fitting outside weld, to the forward dome, segment 7, revealed a weld overlap, as indicated in view 4.	Weld overlap was ground out, blended and re-dye checked. Rework was acceptable to Engineering for use.
60	A120090 12-16-64	Visual inspection of flange GG, located on dome segment 8, S/N 88, revealed an underfill condition on the outside weld, 2 1/2 in. long.	Defect area rewelded. Rework was acceptable to Engineering for use.
61	A123105 1-7-65	a. X-ray 64-B205 of the FF fitting, to forward dome segment 2, revealed dense inclusions on the outside weld view 2. b. X-ray 64-B205, R1 revealed more inclusions.	a. Defect area was ground out, replaced in weld fixture, re-welded, and resubmitted. b. Fitting weld was dressed down, polished to contour to B/P requirements. Rework was acceptable to Engineering for use.
62	A123107 1-8-65	Dye check of the outside weld of the FF fitting to forward dome segment 2, revealed weld overlap between views 1 and 2.	Defect area was scraped lightly, re-dye checked, and re-submitted. The rework was acceptable.

TABLE II, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
63	A123108 1-8-65	X-ray 64-B205, inside weld, of the FF fitting, revealed voids at views 1 and 2.	Defect in view 1 was acceptable to Engineering for use. Defects in view 2 were ground out, revelded, re-X-rayed, and resubmitted. Rework was acceptable to Engineering for use.
64	A123109 1-8-65	X-ray 64-B205, inside weld, of the AC-AC fitting, revealed a cluster of porosity in view 6, and voids with tails in view 5.	Defects revealed in views 1 and 6 were acceptable to Engineering for use. Defect areas revealed in view 5 were ground out, re-welded, re-X-rayed, and re-submitted. Rework was acceptable to Engineering for use.
65	A123114 1-14-65	Dye check of forward dome meridian welds revealed: a. Outside welds 1. Seam 6 - No. 4 porosity at 48 7/8 in., 54 7/8 in., 79 7/8 in. No. 3 porosity at 56 1/4 in., 97 1/4 in. 2. Seam 8 - No. 3 porosity at 2 1/4 in. No. 4 porosity at 118 1/2 in. b. Inside welds 1. Seam 4 - No. 4 porosity at 29 3/8 in. 2. Seam 7 - No. 3 porosity at 10 1/4 in., 24 in., 171 in., 171 1/2 in., 183 1/4 in., and 26 in. No. 4 porosity at 21 3/4 in. 3. Seam 8 - No. 3 porosity at 34 1/4 in.	The defect areas were scraped flush with parent material, re-dye checked, and re-submitted. Defects were not completely removed. Defects were removed per DPS 4.707-1 and -4. Rework was acceptable to Engineering for use.

TABLE II, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
66	A123117 1-16-64	Dye check of AC-AC fitting on dome segment 2 revealed a crack on the inside weld.	Noted defect was ground out, dye-checked, and re-X-rayed. Rework was acceptable to Engineering for use.
67	A123119 1-20-65	Dye check of forward dome meridian welds revealed: a. Seam 1 - No. 3 porosity at 129 3/4 in. b. Seam 2 - No. 3 porosity at 4 7/8 in., 5 1/2 in., 5 3/4 in., 32 3/8 in., 38 1/2 in., 50 3/4 in., 56 3/8 in., 60 1/2 in., 62 5/8 in., 66 5/8 in., 69 1/2 in., 78 in., 82 in., 84 1/2 in., 100 5/8 in., 109 3/8 in., 120 1/2 in., 137 in., 169 1/4 in., and linear porosity at 68 in. to 68 1/4 in. c. Seam 9 - No. 3 porosity at 6 3/4 in., 21 3/8 in., 29 1/4 in., 62 in., 66 in., 72 in., 104 5/8 in., 106 in., 187 3/8 in., 161 5/8 in., 125 5/8 in. d. Seam 2 - No. 3 porosity at 2 1/2 in., 3 1/2 in., 41 3/4 in., 42 in., 43 in., 46 in., 47 1/4 in., 111 1/4 in., 135 1/2 in., 149 in., 180 in., 185 1/2 in., 189 3/8 in. Linear porosity at 38 in. to 38 1/2 in. e. Seam 9 - No. 3 porosity at 8 in., 12 1/2 in., 125 5/8 in., 13 1/4 in., 14 7/8 in., 17 in., 57 in., 84 1/4 in., 125 3/4 in., and 175 3/4 in.	Weld bead was scraped flush in all defect areas, re-dye checked, and re-submitted. All defects were not eliminated. All defect areas were ground out and blended. Rework was acceptable to Engineering for use.
68	A123124 1-23-65	X-ray 64-B205 of the meridian weld seams revealed revealed:	All noted defects were ground out and blended, re-dye checked and resubmitted with the exception of

TABLE II, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
68 (Cont)	A123124 1-23-65	a. Seam 1 - Cluster of porosity at 4 1/2 in., 8 1/8 in., 15 3/4 in., 17 1/2 in., 18 1/4 in., 46 1/2 in., 87 1/2 in., 89 in., 117 3/4 in. Void with tail at 8 3/16 in., inclusion at 11 1/8 in., 11 1/4 in., 13 3/4 in., 85 11/16 in., scattered porosity at 25 1/2 in. to 27 1/2 in. b. Seam 2 - Cluster of porosity at 54 1/8 in., 59 in., 64 1/2 in., 64 7/8 in., 109 3/4 in., 112 1/4 in., 134 3/4 in., 135 in., 148 3/8 in. void with tail 64 7/8 in., 138 15/16 in., inclusion at 42 7/16 in., 78 1/2 in., and scattered porosity at 56 1/2 in. to 61 1/2 in., cluster of porosity at 52 15/16 in. c. Seam 3 - Cluster of porosity at 89 7/8 in., void with tail 2 1/2 in., 154 5/8 in., and cluster of porosity 86 in., 174 7/8 in. d. Seam 4 - Void with a tail at 29 5/16 in., inclusions at 95 3/4 in., 188 3/4 in., scattered porosity 170 1/2 in to 172 in., and cluster of porosity at 46 1/4 in., 53 in. and 185 15/16 in. e. Seam 5 - Void with a tail at 4 1/8 in., inclusions at 6 13/16 in., cluster of porosity at 73 15/16 in., lack of fusion at 0 in. to 2 1/4 in. f. Seam 6 - Inclusion at 81 11/16 in. and 143 1/2 in. g. Seam 7 - Cluster of porosity at 25 7/8 in., 41 1/2 in., 48 3/8 in., void with a tail at 10 1/8 in., 171 3/8 in.	those defects on seam 2, which were ground out, re-welded, and re-dye checked.

TABLE II, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
68 (Cont)	A123124 1-23-65	h. Seam 8 - Cluster of porosity at 9 1/16 in., 14 9/16 in., 59 3/4 in., 105 3/4 in., 107 in., void with a tail at 12 1/2 in., 76 1/4 in., inclusions at 34 3/16 in., 60 in., 122 7/8 in., 145 7/8 in., 170 1/4 in. i. Seam 9 - Cluster of porosity at 12 5/8 in., 19 1/8 in., 22 5/8 in., 73 3/4 in., 103 3/4 in., inclusions at 100 1/2 in., 146 5/8 in., and cluster of porosity at 100 7/8 in., 151 3/4 in. Linear porosity 11 5/8 in.	
69	A123130 2-2-65	The following defects were noted on forward dome meridian welds, as a result of disposition on FARR A123124. a. Scattered porosity on seam 2. b. Underfill on seam 3. c. Linear porosity and a 0.040 in. void on seam 7. d. Underfill, linear porosity, and two 0.045 in. voids on seam 9.	a. Porosity was ground out, and the areas re-dye checked. The bend-out was polished. b. The underfill was blended out. c. The porosity was ground out, re-dye checked, and re-X-rayed. The void was acceptable. d. The underfill was blended out. The porosity was acceptable in two locations, and ground out and re-X-rayed in the third location. All rework was acceptable to Engineering for use.
70	A123139 2-14-65	X-ray 65-B205 of the flange to forward dome weld revealed lack of complete weld penetration, extending from 4 5/8 in. to 5 in. from S5 towards S6.	Defect area was flush welded on both sides, re-positioned in the weld fixture, re-welded, re-shaved, and re-X-rayed. Rework was acceptable to Engineering for use.

TABLE II, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
71	A123140 2-16-65	Dye check of flange to dome weld revealed: a. Check condition extending intermittently from seam 5 to seam 6 on outside surface. b. No. 3 porosity existing between seams 4 and 5, and 9 and 1.	All defect areas were treated with a caustic etch solution. Dye check results were negative. The defect areas were than scraped or ground out and blended to a ratio of 10:1, and re-dye checked. Rework was acceptable to Engineering for use.
72	A123149 2-23-65	X-ray 65-B205 of AF-AF fitting, P/N 1A39304-505, showed scattered porosity at views 1 and 2.	Acceptable to Engineering for use.
73	A123155 1-5-65	Visual inspection of meridian seam 9 revealed suck back conditions at various locations, varying in length from 1/4 in. to 1/3 in.	Defect area was shaved flush inside and out, and the entire seam was re-welded.
74	A123164 1-9-65	a. Visual inspection of meridian seam 9 reweld showed that the reweld terminated at 40 in. from aft end. Entire seam should have been rewelded per FARR A123155. b. Two approximately 3/16 in. diameter holes existed at edge of weld seam on the side of segment 1, at 54 in. and 54 3/4 in. from aft end. c. Penetration along entire length of reweld was irregular.	The weld seam was shaved flush on outside and inside. Segment 1 was removed and trimmed, then replaced in weld fixture and rewelded. The rework was acceptable.
75	A126901 1-15-65	Visual inspection of skin segment 2 revealed 1/8 in. fillet weld penetration of skin segment, 2/3 around the vent line clip, P/N 1A59865-1.	The excessive drop-through was sanded flush with parent metal, dye checked, and re-submitted. Rework was acceptable to Engineering for use.

TABLE II, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
76	A126902 1-15-65	Visual inspection of skin segment 2 revealed an out of contour condition located around the AC-AC fitting.	Defect area was re-formed to B/P requirements, and AC-AC fitting was dye checked and re-submitted. Rework was acceptable to Engineering for use.
77	A126903 1-17-65	Inspection of forward dome segment 2, S/N 87, was trimmed wide on one side. Was 1 25/32 in., should have been 1 1/4 in.	Acceptable to Engineering for use without rework.
78	A126904 1-19-65	Visual inspection of meridian weld seam 9 revealed back side shrinkage. Located 16 1/2 in. forward rough trim line. Defect covered 1/4 in. span, 0.005 below parent material.	The defect area was flush welded and blended smoothly, and re-submitted. This FARR closed by FARR A123119.
79	A126911 1-31-65	Inspection of reweld, per FARR A123124, of meridian weld seam 3 revealed: a. Lack of penetration on interior side of weld, 1/4 in. area at 22 1/4 in. from rough trim line at forward end of dome. b. Intermittent transverse cold shuts at crown of interior weld bead.	Defect areas were shaved flush. Defects were removed. Rework acceptable to Engineering for use.
80	A126914 2-4-65	Inspection of meridian seam 9, after all rework specified on FARR A123124, and P1 tape measurement, revealed an out of contour condition. Was 259.570 at 68°F, should have been 259.702 ± .060 at 68°F.	Acceptable to Engineering for use.
81	A126915 2-6-65	Visual inspection of forward dome assembly segment 2, inside surface, revealed excess material 1/4 in. wide 0.008 high, extending from 5 3/4 in. from seam 2 to 5 3/4 in. from seam 1. Also two low spots approximately 1/4 in. X 1/8 in. X 0.098, 41 in. and 50 in. from seam 2, located in same area were noted.	Excess material was removed flush with adjacent material. Low spots existing in this area were ground to smooth up rough areas. Defect areas were dye checked. Rework was acceptable to Engineering for use.

TABLE II, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
82	A126920 2-16-65	Inspection revealed a can in forward dome segment 6, 7 1/2 in. X 5 1/2 in. X 0.100, near flange weld.	Acceptable to Engineering for use.
83	A126930 2-20-65	Ovality of jamb was 0.032, should be 0.010 per B/P 1A39304, in area of seam 5, and seam 6, as indicated on QEC 671.	Acceptable to Engineering for use.
84	A126936 2-24-65	The 1/8 in. fillet weld was not welded completely 360° per view AE-AE. 1/2 in. openings existed at ends of standing legs of tees, P/N's 1B41942-1 and 1B42297-1, in segments 7 and 8.	Acceptable to Engineering for use without rework.
85	A126938 2-25-65	Visual inspection of forward dome revealed: a. An out of contour condition existing at 30° latitude and at 0°, 20°, and 40° longitude. Variations exceeded ± 0.090, as recorded on QEC 653A. b. An out of contour condition existed at 60° latitude and at 0°, 140°, 180°, and 270° longitude. Variations from nominal radius exceeded ± 0.090, as recorded on QEC 653A. c. An out of contour condition existed at 82° latitude and at 160°, 180°, 200°, 220°, 240°, and 260° longitude. Variations from nominal radius exceeded ± 0.090, as recorded on QEC 653A. d. AC-AC fitting B, centering dimension was 375, should be 0.250 maximum per B/P (Ref. QEC chart 653E). e. Concentricity of flange was 0.160, should be 0.125 maximum, per B/P (Ref QEC 653B).	Acceptable to Engineering for use.

TABLE II, Section 2 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
86	A169003 10-3-65	Contaminated areas existed on the forward dome between the LH_2 door jamb and the debris shroud. The liner, P/N 1A93131-15, and the debris shroud, P/N 1B56480-3, were discolored.	The contaminated areas were cleaned with water and wiped down with mek. The aluminized mylar bonding was checked. After some remaining contamination was cleaned from the debris shroud, the nylon fibers were refinished and analyzed for damage. No major degradation was found, and the rework was acceptable for use.

TABLE II (Continued)

Section 3. Cylindrical Tank Assembly, P/N 1A39306-505

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
87	A074385 1-14-65	There was a scratch, 0.002 to 0.003 in. deep, on the tank skin, adjacent to weld seam 7, segment 1. The scratch was 5/8 in. from the edge of the segment, and ran intermittently throughout its entire length.	The scratch was blended in using no. 400 grit paper. The rework was acceptable.
88	A074450 3-4-65	Three test panels failed to meet the requirements of DPS 4.50-3 for zinc chromate primer film thickness of 0.3 to 0.4 mils, as follows: a. Panel 2 - thickness was 0.8 mils. b. Panel 3 - thickness was 1.3 mils. c. Panel 4 - thickness was 0.7 mils.	Acceptable to Engineering for use.
89	A074456 2-25-65	Visual inspection of the aft ring to cylindrical tank weld showed concavity on the bead side of the weld, at the junction of the bead to the ring. The maximum depth was 0.017 in. below the parent material. The concave area measured 8/32 in. X 7/32 in., and was located 36 in. from longitudinal seam 7 toward seam 1.	Acceptable to Engineering for use.
90	A074460 2-14-65	Visual inspection of the aft ring to cylindrical tank weld showed: a. Shrinkage and suckback on the penetration side of the weld at 47 in. to 51 1/4 in. from seam 2 toward seam 3. b. Lack of penetration at 11 1/8 in. to 12 in. from seam 3 toward seam 4. c. Weld shrinkage 1 1/4 in. long, 35 1/4 in. from seam 7 toward seam 1.	The welds were shaved, and the defect areas were ground out, dye checked, and X-rayed. The rework was acceptable to Engineering.

TABLE II, Section 3 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
91	A074551 1-19-65	Visual inspection of tank segment 4, S/N 0070, was not trimmed to SEO 1A39306-014. Trim from edge of skin was 1.230 in. minimum to 1.263 in. maximum should have been 1.250 in. $\pm \frac{.005}{.010}$ in.	Acceptable to Engineering for rework.
92	A074558 1-20-65	a. Visual inspection of cylinder seam 4 revealed a 1/16 in. cold shut transverse to penetrated bead. b. Dye check revealed 3/16 in. long indication in the parent material. c. Visual inspection revealed surface inclusions and scratches, occurring intermittently in parent material, adjacent to the weld. X-ray 65-41 confirmed these defects.	a. The weld was shaved on both sides, and the defects were ground out, dye checked, and X-rayed. b. The defects were ground out, re-dye checked, and X-rayed. c. The inclusions were scraped off, maintaining a 5:1 ratio. The area was polished, re-dye checked, and re-X-rayed. All rework was accepted by Engineering for use.
93	A074562 1-25-65	On longitudinal seam 4, 116 3/4 in. from forward to aft, dye check showed transverse dye indication 1/4 in. long, at the center of the weld, on the outside of the tank.	The weld was ground out as necessary to remove the transverse indication, maintaining a 10:1 ratio. The ground area was polished and re-dye checked. The rework was acceptable to Engineering for use.
94	A074571 1-27-65	a. Skin segment, P/N 1A39277-503, was out of tolerance. Forward was 0.2595, aft end was .265 in., should be .252 $\pm$ .005 in. b. Skin trim 0.187 in. dimension $\pm$ was 0.193 in. minimum to 0.197 in. maximum, due to above discrepancy.	Acceptable to Engineering for use.

TABLE II, Section 3 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
95	A074588 1-28-65	Visual inspection of longitudinal seam 2 revealed: a. Irregularity, with a transverse crack, 53 1/4 in. to 53 3/4 in. from the forward end. b. Irregularity with a transverse crack, 163 1/2 in. to 163 3/4 in. from the forward end. c. Irregularity with a transverse crack, 215 1/4 in. to 215 3/4 in. from the forward end.	The weld was shaved inside and out, except at the defect areas. X-ray and dye checks then confirmed the existence of the cracks. The outside was ground out to remove cracks, re-dye checked, and re-X-rayed. The rework was acceptable to Engineering for use. The inside was then ground out acceptably.
96	A074712 2-16-65	Visual inspection of the inside diameter of the forward ring to cylindrical tank weld revealed: a. Cold lap, 6 1/4 in. to 7 1/8 in. from seam 6 toward seam 7. b. Lack of penetration, 60 1/2 in. to 62 1/2 in. from seam 5 toward seam 6. c. Lack of penetration, 28 in. to 80 in. from seam 5 toward seam 6.	The weld was shaved, dye checked, and X-rayed. The rework was acceptable to Engineering.
97	A074716 2-18-65	Dye check of the inside diameter of the forward ring to cylindrical tank weld revealed: a. Intermittent linear porosity, and linear dye check indications throughout the cylindrical side of the weld. b. Linear dye check indications on the ring side of the weld at areas of off-center penetration as follows:	The indications were ground out, re-dye checked, and X-rayed. The rework was acceptable to Engineering for use.

TABLE II, Section 3 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
97 (Cont)	A074716 2-18-65	1. At 17 1/2 in. to 18 1/2 in., 70 in. to 72 in., and 79 1/2 in. to 82 1/2 in. from seam 1 toward seam 2. 2. 20 in. to 24 in. from seam 2 toward seam 3. 3. 17 1/2 in. to 18 1/2 in., and 24 in. to 28 in., from seam 3 toward seam 4. 4. 39 to 31 in., 52 to 54 in., and 109 in. to 111 in. from seam 7 toward seam 1.	
98	A074810 2-20-65	Dye check of the I.D. of the aft ring to cylinder weld revealed light intermittent linear porosity, and linear dye check indications, throughout the cylinder side of the weld bead.	The defect areas were ground out and re-dye checked. The dimensions of the resulting voids were recorded, and the rework was acceptable to Engineering for use.
99	A074860 2-4-65	Visual inspection of longitudinal seam 5 showed intermittent scratches and gouges 0.003 in. deep, in the parent metal, adjacent to the penetrated bead on the O.D. side.	The scratches and gouges were blended out to a 10:1 ratio. The rework was acceptable to Engineering for use.
100	A074861 2-4-65	Visual inspection of longitudinal seam 6 showed: a. Intermittent scratches and gouges adjacent to the penetrated bead on the O.D. side. b. Two 0.011 in. longitudinal gouges in the surface of weld on the I.D. side, 19 3/4 in. from the forward end.	The scratches and gouges were blended out, maintaining a 10:1 ratio. The rework was acceptable.

TABLE II, Section 3 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
101	A074813 2-22-65	Dye check of the O.D. of the aft ring to cylinder weld showed: a. Greater than no. 3 porosity, 51 3/4 in. from seam 1 toward seam 2. b. Crack, 60 in. from seam 2 toward seam 3. c. Greater than no. 3 porosity, 38 in., 57 in., and 67 in. from seam 3 toward seam 4. d. Greater than no. 3 porosity, 71 in. from seam 5 toward seam 6.	The defect areas were ground out and re-dye checked. The rework was acceptable to Engineering for use.
102	A113986 11-11-64	X-ray of aft ring, before machining, revealed linear porosity in S3 view A.	Acceptable to Engineering for use.
103	A114000 11-21-64	X-ray 64-B199, inside weld, of the helium bottle support fitting, to cylindrical tank segment 2, revealed less dense inclusions in. 1V1, 1V3, 2V1, 2V3, 2V3, 2V4, 3V1, and 4V4.	Acceptable to Engineering for use.
104	A118275 11-25-64	X-ray 64-B199, outside weld, of support fittings on cylindrical tank segment 2, revealed inclusions in 1V1, 1V2, 1V3, 2V3, 4V3, and 4V4.	Defect areas in 1V1 were ground out, rewelded, re-X-rayed, and resubmitted. Rework was acceptable to Engineering for use. All other defects were acceptable to Engineering without rework.
105	A120053 11-27-64	X-ray 64-B201, inside weld, of support fittings on segment 3, revealed inclusions in 1V1, 1V2, 1V3, 3V2, and 4V2.	Acceptable to Engineering for use.
106	A120054 11-27-64	X-ray of the forward cylindrical tank ring revealed: a. S1 - Edge of standing leg ground below the parent.	Defects noted on seams 1, 2, and 3 were acceptable to Engineering for use without rework. Defect noted on seam 4 was ground out and rewelded. Rework was acceptable to

TABLE II, Section 3 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
106 (Cont)	A120054 11-27-64	b. S2 - Face of base leg was ground below parent material. c. S3 - Edge of the standing leg was ground below the parent material. d. S4 - Line of fusion crack, view 6, of the standing leg in an area ground below the parent material.	Engineering for use.
107	A120058 12-1-64	X-ray 64-B199 of the clevises on segment 4 revealed lack of fusion.	Acceptable to Engineering for use.
108	A120072 12-18-64	X-ray 64-B202AM, of the machined cylindrical tank ring segments seam weld, revealed: a. Cluster of porosity, view A, seam 2. b. Crack, view A, seam 4.	a. Acceptable to Engineering for use. b. The area was ground out and rewelded. A notch was cut in the bottom of the grind out, and the area rewelded once more, re-dye checked, and re-X-rayed. The rework was acceptable to Engineering for use.
109	A120078 12-1-64	Because of a voltage drop while welding helium bottle support fitting 2 to segment, P/N 1A39306-405, S/N 00003, the weld did not meet the requirements of DPS 10.320-4.	The weld was chipped out flush with the parent material, and the fitting was rewelded to the segment. The rework was acceptable to Engineering for use.
110	A120094 12-17-64	There was an underfill area at the outboard edge of weld seam 2, measuring 1/16 in. X 3/32 in. The depth ranged from 0.020 in. inboard to 0.062 in. at the outboard edge.	The area was blended out and re-dye checked, and the rework was accepted by Engineering for use.

TABLE II, Section 3 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
111	A133201 3-3-65	The center line of the tank shell was 0.015 in. out of B/P tolerance per QEC 795.	Shims were placed between the aft ring and tool faces. The tank was re-installed, maintaining B/P overlap requirements. The rework was acceptable to Engineering.
112	A133489 3-22-65	The overlap dimension with the LOX tank assembly measured: a. Location B - 1.656 in. b. Location C - 1.656 in. c. Location D - 1.656 in. d. Location E - 1.625 in. e. Location F - 1.656 in. Minimum allowable overlap was 1 3/4 in. + 1/8 - 1/16 per QEC 711.	Acceptable to Engineering for use.

TABLE II (Continued)

Section 4. Liquid Oxygen Tank Assembly, P/N 1A39307-505

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
113	A123123 1-22-65	X-ray 65-B7 of the forward and aft welds revealed areas of scattered porosity, undercut, and inclusion in the aft weld. Underfill, voids, and intermittent linear porosity were noted in the forward weld.	The scattered and linear porosity and the void area were acceptable for use. The undercut, inclusion, and underfill areas were ground out, rewelded, re-X-rayed, and accepted.
114	A123156 1-5-65	Visual inspection of the LOX baffle assembly revealed: a. Fifty 5/32 in. rivet holes in panel, P/N 1A39307-9, located at position 3, had short edge distance of from 5/16 in. to 7/32 in. Several rivets fell close to the radius of angle, P/N 1A39307-29. b. One 5/32 in. rivet hole in splice, P/N 1A39307-19, located between positions 3 and 4, had short edge distance of 3/16 in.	Acceptable to Engineering for use.
115	A123168 1-12-65	Tab on the flange of frame, P/N 1A39307-37, was mislocated approximately 1 1/2 in. One flange of bracket, P/N 1B37177-1, would not pick up tab when the bracket was not located per B/P.	The mislocated tab was cut off and replaced per SEO 1B31289-001A. The rework was acceptable.
116	A123172 1-13-65	At position 4, toward position 3, the no. 40 pilot holes at joggle cuds of two flanges on bracket, P/N 1B31289-37, would not pick up the hole pattern in two holes common to angle, P/N 1A39267-33, and panel, P/N 1A39267-7.	The angle was burred. An AD5 rivet was installed, and cut flush inside, in the no. 40 pilot hole. The rework was acceptable.
117	A126905 1-25-65	There were burned areas, varying from 1/4 in. to 3/8 in. long X 1/8 in. wide X 0.050 in. deep, at the edge of the ring, adjacent to the aft weld. The areas were located 41 in., 45 1/2 in., 47 in., 48 in., 49 in., 68 in., and 70 in. from seam 6 toward seam 7.	The burned areas were smoothed, blended out, and polished. The rework was acceptable.

TABLE II (Continued)

Section 5. Common Bulkhead Assembly, P/N 1A39309-501

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
118	A099344 6-27-64	X-ray 64-B109 of aft face meridian welds revealed the following defects: a. S2 - Void at 77 7/8 in. from aft end. b. S3 - Linear porosity 128 1/2 in., and void with tail 130 3/4 in. from aft end. c. S6 - Inclusion at 117 3/8 in. from aft end. d. S7 - Linear porosity at 103 5/8 in. from aft end.	Seams 6 and 7 were determined to be acceptable without rework. Seams 2 and 3 were flushed in the defect areas, re-X-rayed, and found to be acceptable to Engineering for use.
119	A099355 6-30-64	Dye check of aft face meridian weld seams revealed porosity in the following locations: a. S6 outside - 43 1/2 in., 60 1/2 in., 84 1/2 in., and 62 in. b. S7 outside - 129 3/4 in. c. S8 outside - 26 5/8 in., 78 7/8 in., and 105 in. d. S2 inside - 77 in. e. S4 inside - 10 3/4 in., 53 1/2 in., and 144 in. f. S5 inside - 77 1/2 in. g. S6 inside - 51 in. h. S7 inside - 88 1/2 in., and 102 in. i. S8 inside - 108 1/2 in.	All defect areas were ground out and blended to ratio of 10:1. Rework was acceptable (except S8) to Engineering for use. After first rework defects on S8 were still present. Therefore the unit was re-positioned in the weld fixture and rewelded and re-X-rayed. Rework was acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
121	A099393 7-21-64	X-ray 64-B109 of the ring to aft common face assembly weld revealed: a. Penetration offset from weld joint, causing straight line image in film area of weld center line, intermittently around the complete circumference. b. S3 to S4 - Void with a tail 34 in. forward from S3 towards S4. c. S4 to S5 - Linear porosity 10 1/2 in., and a crack and inclusion at 13 in. from S4 towards S5. d. S6 to S7 - Voids with tails at 28 1/2 in. and 46 1/4 in. from S6 towards S7. e. S7 to S8 - Inclusions at 27 1/4 in., 65 1/2 in., and 79 1/4 in. from S7 towards S8. f. S8 to S9 - Scattered porosity 14 1/4 in., inclusions 19 1/2 in. and 21 1/4 in. void with a tail 22 1/2 in., inclusions 38 1/2 in. and 41 1/4 in., void with tails 47 1/2 in., 37 1/4 in. and 57 1/4 in. from S8 towards S9.	The circumferential weld bead was shaved flush on both sides, re-dye checked, and re-X-rayed. Slight defects still existed therefore the unit was repositioned in the weld fixture and rewelded. Rework was acceptable to Engineering for use.
122	A099406 7-28-64	X-ray 64-B109 of aft common bulkhead to ring weld revealed: a. Penetration offset from the weld joint, causing a straight line image on the film in area of weld center line, extending intermittently around the entire circumference. b. Intermittent transverse lap condition, extending for the entire circumference of weld.	Rework was performed in accordance with SEO 1A39286-003. Rework was acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
122 (Cont)	A099406 7-28-64	c. S4 to S5 - Scattered porosity 37 1/2 in. to 39 in. S6 to S7 - Lack of weld fusion extending from 3/8 in. to 1 1/8 in. from S7 aft towards S6. S7 to S8 - Inclusion 79 1/4 in. from S7 towards S8. S8 to S9 - Lack of weld fusion 11 in. to 14 in., and an inclusion at 14 3/4 in. S9 to S1 - Scattered porosity 73 1/2 in. from S9 towards S1. d. Lack of weld metal fill, extending intermittently around entire circumference of weld. e. 1/4 in. X 5/16 in. hole in weld, 30 in. from S3 towards S4.	
123	A099453 8-25-64	X-ray 64-B144 revealed defects in the weld seams of aft ring assembly at locations noted below: a. S1A - Cracks and void. b. S2A - Void with a tail. c. S3A - Scattered porosity. d. S1B - Lack of penetration and linear porosity. e. S2B - Cracks. f. S3B - Cracks.	Defect areas along S2A and S3A acceptable to Engineering for use without rework. Defect areas on S1A, S1B, S2B, S3B, were ground out, re-welded, re-X-rayed, re-submitted and found acceptable to Engineering for use.
124	A099465 8-31-64	a. X-ray 64-B109 revealed a crack on the aft bulkhead to ring circumferential weld, 20 in., from seam 3 towards seam 5. b. Dye check of the ring to bulkhead circumferential weld inside and outside revealed	All defects were sanded or lightly ground out, re-dye checked, re-X-rayed, and re-submitted. Rework was acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
124 (Cont)	A099465 8-31-64	lack of fusion at boundry of penetration, scattered porosity, check conditions, and cracks at numerous locations.	
125	A099472 9-2-64	X-ray 64-B144 and dye check of the aft circumferential weld seam revealed: a. Seam 1 - Crack and no. 3 porosity. b. Seams 2 and 3 - No. 3 porosity.	All defects were ground out, removing a minimum of material, and blended to a ratio of 10:1. Rework was acceptable to Engineering for use.
126	A099482 9-11-64	X-ray 64-B153 of the forward common ring assembly segment seam weld showed: S2B - Scattered porosity. S3A - Crack. S3B - Ground out areas.	Seam 3A ground out. Seams 2B and 3B were acceptable without rework. Rework acceptable to Engineering for use.
127	A099487 9-13-64	Dye check of forward common ring assembly revealed cracks in seams 2 and 3.	Defect areas were ground out and re-dye checked. Rework was acceptable to Engineering for use.
128	A099490 9-15-64	Dye check of forward common ring after C/S revealed: a. Seam 2 - Cracks and 3 porosity view BB and DD. b. Seam 3 - Cracks view CC.	Defect areas on seams 2 and 3 were ground out removing a minimum amount of material and re-submitted. Rework was acceptable to Engineering for use.
129	A101285 7-7-64	Visual inspection of meridian weld seam 7, inside, revealed two ground out and blended areas located 7 1/2 in. from the aft trim line, and 1/16 in. from edge of seam weld.	Acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
130	A110539 9-15-64	Visual inspection of aft bulkhead to ring installation revealed: Gap of 0.028 to 0.016 in a one in. area between aft edge of face and standing leg of ring, 17 in. from seam 7 of dome toward seam 8. Maximum gap should have been 0.015 in.	Acceptable to Engineering for use.
131	A110545 9-18-64	Visual inspection of aft circumferential weld seam (ring to aft common face) revealed intermittent lack of penetration between seams 3 and 4, 4 and 5, 5 and 6, 6 and 7, and 8 and 9.	The entire circumferential weld was shaved OD and ID, and re-X-rayed. Defects persisted. Defect areas were ground out to maximum depth. Some defects persisted. Unit was re-placed in the weld fixture, and rewelded. See FARR A113941 for final Disposition.
132	A111958 10-12-64	Re-dye check of seams 1 and 2, per disposition on FARR A113926, showed no dye check indication in the blended area.	Area was blended out to a 10:1 ratio. After additional dye check, the rework was accepted for use.
133	A111976 10-22-64	Visual inspection of meridian weld seam 1 revealed: a. Height of drop-through on inner side of weld at following locations was 0.010 at 89 in., 0.012 at 51 1/2 in., 0.020 at 69 in., and 106 in., 0.025 at 34 in., 37 in., 42 in., and 70 in. b. Seam 2 drop-through was 0.020 at 90 in. from aft trim line. NOTE: Measurements taken from rough trim line at aft end of seam.	Acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
134	A111977 10-22-64	Visual inspection of forward face meridian seams 5 and 7 revealed: a. Seam 5 - Back side shrinkage was noted 7 to 7 1/8 in., 0.010 high and 8 3/4 in. to 9 1/2 in., 0.005 to 0.008 below parent material. b. Seam 7 - Drop-through on inside of weld was 0.022, 1/16 in. in area, 36 in. from rough trim line.	Acceptable to Engineering for use.
135	A111979 10-23-64	Recorder for automatic welding fixtures was not hooked up to record welding parameters per DPS 10.320-4. This condition continued to exist until a filter was made available.	Acceptable to Engineering for use.
136	A113926 10-6-64	No. 3 porosity existed in weld seams 1 and 2 of aft common ring assembly, P/N 1A39286-9, S/N 00011.	The defects were ground out to a depth of 0.012 in. at seam 1, 0.088 in. at seam 2. After smoothing and dye checking, the rework was acceptable to Engineering for use.
137	A113928 10-8-64	Dye check of weld seam, hoist fitting 3 on forward common ring revealed a crack.	Defect area was flushed off lightly, re-dye checked, and re-submitted. Rework was acceptable to Engineering for use.
138	A113941 10-17-64	X-ray 64-B109 of the aft circumferential weld seam (ring to aft common face) revealed numerous defects.	Defects were all ground out, but determined not acceptable to Engineering for use. The unit was re-placed in weld fixture, and rewelded. NOTE: See FARR A113952 for disposition on rework.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
139	A113952 10-24-64	X-ray 64-B109 of the aft common face circumferential weld revealed a cluster of porosity at 13 1/4 in. from S5 towards S6.	Acceptable to Engineering for use.
140	A113953 10-24-64	Dye check of the inside surface of the aft common face to ring circumferential weld revealed: a. Longitudinal check condition extending intermittently for the entire circumference of the ring, adjacent to the circumferential weld. b. No. 2 porosity extending intermittently for entire circumference of the weld.	The longitudinal check condition was scraped, removing a minimum amount of material. Dye check confirmed check condition removed. Intermittent porosity, extending for the entire circumference of the ring was ground out to no. 1 porosity, re-dye checked, and re-submitted. Rework was acceptable to Engineering for use.
141	A113954 10-25-64	X-ray 64-B178 of the forward common face assembly meridian welds revealed: a. S2 - Inclusion at 15 1/2 in. and cluster of porosity at 7 ft. 11 3/4 in. b. S3 - Connected porosity at 36 1/2 in. c. S4 - Void at 6 ft. 5 1/8 in. and a cluster of porosity. d. S6 - Inclusion at 6 ft. 8 1/4 in., 6 ft. 9 3/8 in., and a cluster of porosity at 6 ft. 10 1/4 in. and a cluster of porosity and an inclusion at 7 ft. 2 3/8 in. e. S7 - Cluster of porosity at 4 3/4 in. connected porosity at 17 1/4 in., 23 1/8 in., and 12 ft. and an inclusion at 12 ft. 7 1/4 in.	Defect areas on seams 2, 3, 4, and 5 were found to be acceptable to Engineering for use without rework. Defect areas on seam 7 were ground out and blended to a ratio of 10:1. Rework was acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
142	A113960 10-28-64	Dye check of forward face meridian inside welds revealed: a. Seam 6 - No. 2 porosity at 83 in. and no. 3 porosity at 91 1/4 in. b. Seam 7 - Linear porosity from 1 in. to 20 in.	Defect areas on seam 6 were ground out and reduced to no. 1 porosity and re-submitted. Defects on seam 7 were sanded lightly and re-submitted. Rework was acceptable to Engineering for use.
143	A113972 11-4-64	X-ray 64-B178 of the forward common face assembly to ring weld revealed: a. S1 to S2 - Voids at 6 1/4 in., 15 5/8 in., 16 in., 27 3/8 in., and 32 in. connected porosity at 23 1/8 in., 25 3/8 in., 28 in., and 29 1/2 in. b. S2 to S3 - Cluster of porosity at junction of meridian S2 and circumferential weld. Linear porosity at 58 in. to 60 1/4 in. and 62 1/2 in. to 65 3/8 in. Void at 67 15/16 in. c. S3 to S4 - Voids at 39 3/8 in., 43 1/8 in., and 43 3/8 in. Connected porosity at 78 in. Linear porosity at 80 1/4 in. to 81 1/2 in. Void with tail at 78 1/2 in. d. S4 to S5 - Voids at 60 1/4 in. and 74 in. Connected porosity at 61 1/2 in. Linear porosity at 15 3/8 in. to 16 in., and 21 1/4 in. to 23 1/4 in. Void with a tail at 16 5/8 in. and 73 1/8 in. Cluster of porosity at 18 3/4 in. e. S5 to S6 - Inclusion at 63 3/4 in.	All defects were ground out. However, all defects were not removed and the ground out areas were in excess of 0.040 below parent material. The unit was replaced in the weld fixture and rewelded. Rework was acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
143 (Cont)	A113972 11-4-64	f. S6 to S7 - Linear inslusions at 58 in. Cluster of porosity at 38 1/8 in. Transverse inclusion at 73 3/8 in. Void with a tail at 74 1/2 in. g. S7 to S8 - Void at 24 in. Connected porosity at 55 1/4 in. and 66 5/8 in. Linear porosity at 52 3/4 in. to 53 in. and 57 1/4 in. to 58 in. Cluster of porosity at 64 in. h. S8 to S9 - Voids at 4 1/2 in., 43 3/8 in., 52 1/2 in. and 58 in. Connected porosity at 11 1/2 in., 52 in. and 63 1/8 in. Linear porosity at S8, 6 1/2 in. to 9 3/4 in. and 14 1/4 in. Cluster of porosity at 5 1/2 in. i. S9 to S1 - Voids at 5 1/8 in., 48 1/2 in. and 56 3/4 in. Connected porosity at 51 in. Linear porosity at 49 3/4 in. to 50 in.	
144	A113980 11-8-64	Dye check of forward common ring installation weld revealed no. 3 porosity 6 1/2 in. back from seam 4, toward seam 3 of the outside weld.	Defect area was ground out and blended to a 10:1 ratio, re-dye checked and re-submitted. Rework was acceptable to Engineering for use.
145	A113983 11-10-64	Dye check of the aft common bulkhead to center plate weld revealed the following defects: a. No. 3 porosity on the inside surface between seam 1 and seam 2. b. No. 2 and 3 porosity on the inside surface between seam 3 and seam 4.	Defect areas were ground out, blended, polished, re-dye checked, and re-submitted. Rework was acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
146	A118257 11-11-64	Visual inspection of aft face to ring weld revealed the following defects: a. Grind out 1/8 in. X 1/2 in. and 0.012 maximum deep, below parent material, located 6 1/2 in. from seam 5 towards seam 6. b. Depression 1/8 in. diameter and 0.006 maximum deep, located 1/8 in. aft of ring to face weld, and 40 in. from seam 7 toward seam 8. c. Depression 1/8 in. diameter and 0.004 maximum deep, located 1/8 in. aft of ring to face weld, and 17 in. from seam 6 toward seam 7. d. Depression 1/32 in. diameter and 0.004 maximum deep, located 5/8 in. aft of ring to face weld, and 7 in. from seam 6 toward seam 7.	Acceptable to Engineering for use.
147	A113991 11-18-64	X-ray 64-B178 of forward common face to center plate weld showed: a. S2 to S3 - Cluster of porosity. b. S3 to S4 - Scattered porosity. c. S5 to S6 - Voids. d. S6 to S7 - Linear porosity. e. S7 to S8 - Void and void with tail. f. S8 to S9 - Void.	1. Defect areas between seams 2 and 3, and 7 and 8, were ground out and re-submitted. 2. Defect areas between seams 6 and 7, and 8 and 9, were flushed locally on both sides and found acceptable. 3. Defect areas between seams 8 and 9 were ground out and re-submitted. 4. All other minor defects were determined acceptable without rework.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
147 (Cont)	A113991 11-18-64		Items 1, 2, and 3 acceptable to Engineering for use.
148	A113997 11-19-64	This FARR is a duplication of FARR A113991.	
149	A113998 11-20-64	Dye check of center plate to common face showed no. 2 porosity existed between S2 and S3, also no. 3 porosity was revealed between S5 and S6. No. 3 porosity noted along seam 5, 3/4 in. from center plate weld.	Defect areas were ground out and blended to a ratio of 10:1. Rework acceptable to Engineering for use.
150	A114495 12-15-64	Between seams 3 and 6, several areas, with a 1/8 in. gap between forward and aft bulkhead rings, the distance between the forward and aft faces was 1.913 in. Maximum allowable distance was 1.875.	An oversize honeycomb core was installed in the affected area. The rework was acceptable.
151	A114499 12-21-64	Maximum temperature differential between thermocouples during the cool down cycle was 80°F, exceeding the allowable maximum of 30°F per DPS 1.964. Test coupons met tensile test requirements.	Acceptable to Engineering for use.
152	A118261 11-12-64	Inspection of aft common face assembly revealed the existence of an out of contour condition at 82° latitude. (Ref QEC chart 511C).	Acceptable to Engineering for use.
153	A118273 11-24-64	Dye check of the outside surface of the ring to bulkhead weld revealed: a. No. 2 porosity at 40 1/8 in. at seam 3 towards seam 4. b. No. 3 and 2 porosity between 13 1/2 in, 14 1/4 in., and two no. 2 porosity areas at 41 1/2 in., at seam 5 towards seam 6.	Defect areas were ground out, reducing the defects to no. 1 porosity or less, blended to ratio of 4:1, and re-dye checked. Rework was acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
154	A118274 11-24-64	Dye check of forward common bulkhead meridian welds, after shaving, revealed: a. Seam 2 - No. 2 porosity at 91 1/16 in. b. Seam 3 - No. 2 porosity at 39 1/4 in. c. Seam 4 - No. 2 porosity at 20 7/8 in. and no. 3 porosity at 26 1/4 in. d. Seam 6 - No. 3 porosity at 106 1/4 in. e. Seam 9 - No. 3 porosity at 42 1/2 in. NOTE: All measurements taken from center plate to ring assembly.	All defect areas were ground out to no. 1 porosity, blended to 10:1 ratio, and re-dye checked. Rework acceptable to Engineering for use.
155	A120057 12-1-64	Dye check of the outside surface of the aft common bulkhead to ring weld revealed: a. S1 to S2 - Linear porosity at the boundry of the weld crown, bulkhead side, extending from 42 1/2 in. to 47 in., 53 to 57 in., and 75 1/2 in. to seam 2 junction. b. S5 to S6 - No. 2 porosity at 15 1/2 in. c. S7 to S8 - Linear porosity at the boundry of the weld, bulkhead side, extending from the junction of S7 to 10 1/2 in., 26 in. to 32 1/2 in., 39 in. to 43 1/2 in., and 82 in. to the junction of seam 8. d. S6 6o S7 - Linear porosity at the boundry of the weld, bulkhead side extending from 42 1/2 in. to 47 in., 53 to 57 in., and 75 1/2 in. to the junction of seam 7.	Linear porosity existing between S1 and S2, S7 and S8, and S6 and S7 were scraped out, re-dye checked, and re-submitted. The porosity between seams 5 and 6 was ground out, blended to a ratio of 10:1, and re-dye checked. Rework was acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
156	A120077 12-1-64	Visual inspection of forward face assembly revealed an out of contour condition at 82° latitude and at 10° to 360° longitude (Ref QEC chart 523, a and b).	Acceptable to Engineering for use without rework.
157	A122251 12-18-64	a. There was a dented area measuring 1/2 in. X 5/8 in. X 0.035 in., located 65 1/2 in. from the ring weld, and 21 1/2 in. from seam 7, on the concave side of skin segment 8. b. At the same location on skin segment 2, a 1/2 in. X 1/4 in. X 0.001 in. dented area existed.	a. The depressed area was filled with HT424 adhesive film to contour. The area was dye-checked, and the rework accepted. b. The area was smoothed up and retouched with alodine per DPS 9.45. The rework was acceptable to Engineering.
158	A123111 1-12-65	Dye check of the common bulkhead assembly welds showed: a. Porosity in meridian welds, seams 3, 4, 6, and 8, eight locations. b. Porosity on center plate, seam 3 to seam 4, three locations. c. Porosity in the ring to bulkhead weld, seams 1 to 2, 2 to 3, 3 to 4, 4 to 5, 6 to 7, and 9 to 1, twelve locations. d. Porosity and crack on outboard face of the forward ring.	The defects were ground out and re-dye checked. Remaining material thicknesses were recorded. The rework was accepted by Engineering.
159	A123162 1-8-65	The installation of the seal weld did not meet the requirements of B/P 1A39309 M. Also, the weld bead was made in the center of the seal weld area. This should have been deleted per B/P.	Acceptable to Engineering for use.

TABLE II, Section 5 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
160	A123163 1-8-65	There were out of contour areas exceeding tolerances per QEC 657 at 30°, 60°, 82°, and 90°.	Acceptable to Engineering for use.
161	A123170 1-12-65	There was foreign material, 1/8 in. in diameter, on the forward face, located 6 in. from seam 2 toward seam 3, and 20 1/2 in. forward of ring toward face weld.	Foreign materials were sanded out, and the rework areas were touched up with alodine.

TABLE II (Continued)

Section 6. Aft Dome Assembly, P/N 1A39308-503

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
162	A113982 11-10-64	X-ray 64-B192 of fitting, P/N 1A39308-27, on outside wall, view FF, revealed a weld overlap and lack of fill at toe of weld, and distorted set-up line outside weld.	Overlap weld area was ground out, and lack of fill area was blended into weld bead contour. Area was re-X-rayed and re-submitted. Rework was acceptable to Engineering for use. Distorted setup line (outside weld) acceptable without rework.
163	A113984 11-10-64	X-ray 64-B192 of outside weld of the SS fitting, located on the aft dome segment 1, revealed foreign material in weld seam.	Acceptable to Engineering for use.
164	A113988 11-12-64	Dye check of aft dome segment 3, fitting BB revealed no. 3 porosity between views 1 and 2 on outside weld, and a crater crack between views 1 and 2 on inside weld.	Defect area on outside weld was ground out and found acceptable for use. Defect area on inside weld was ground out and blended. The blendout was rough, therefore the section was locally rewelded and re-submitted, and found acceptable to Engineering for use.
165	A113993 11-13-64	X-ray 64-B192 outside weld of fitting GG, segment 9, revealed voids with sharp tails, and connected porosity.	Noted defects were ground out, re-welded, re-X-rayed, and re-submitted. Rework was acceptable to Engineering for use.
166	A118251 11-6-64	One percussion stud, P/N 50717A-428-4, located near seam 6, at the forward side of group of four, sheared flush with the skin segment at 25 in.-lbs. torque.	The area was cleaned, and another stud was welded per B/P and satisfactorily tested to torque requirements.
167	A118252 11-6-64	Visual inspection of the SS fitting, located on segment 1, S/N 88, revealed inclusions in outside weld in a 3 in. area.	The entire defect area was ground out, re-welded and re-X-rayed. Rework was acceptable to Engineering for use.

TABLE II, Section 6 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
168	A118255 11-10-64	There was a machined area 3 5/8 in. X 0.075 in. X 0.023 in. on the right-hand side of aft dome segment 5, P/N 1A39139-501, S/N 90. The area was made into an original machined step of 0.125 in. X 0.125 in.	Acceptable to Engineering for use.
169	A118258 11-11-64	SS fitting weld filler on dome segment 1, inside, was undersized in 3/8 in. area. One leg of fillet was only 1/8 in. Both legs should be 3/16 in. per B/P 1A39308.	Acceptable to Engineering for use.
170	A118264 11-16-64	Visual inspection of the BB fitting, located on dome segment 3, was out of ovality as indicated: a. Outside: Flange was 0.029, should be 0.010. b. Inside: Flange was 0.016, should be 0.010.	Acceptable to Engineering for use without rework.
171	A120070 12-16-64	X-ray 64-B192 of flange installation weld revealed a cluster of porosity and scattered porosity between seams 4 and 5, and a cluster of porosity between seams 5 and 6.	Acceptable to Engineering for use without rework.
172	A120074 12-21-64	X-ray 64-B192 of elbow, P/N 1A66390-1, to the RR fitting weld, revealed linear porosity, cluster of voids and dense inclusions in view 1, and scattered dense inclusions in view 2.	All defect areas were ground out, re-welded, re-X-rayed and re-submitted. Rework was acceptable to Engineering for use.
173	A120075 12-22-64	X-ray 64-B192 of SS elbow weld, located on dome segment 1, revealed scattered porosity on views 1 and 2.	Acceptable to Engineering for use without rework.

TABLE II, Section 6 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
174	A120088 12-16-64	Visual inspection of aft dome segments 4 and 5 revealed scratches 1/8 in. to 3/8 in. long, and 0.001 to 0.002 deep, on convex or exterior surface of segment, immediately adjacent to flange weld.	Defect areas were sanded lightly to remove scratches, and touched up with alodine 1200. Rework acceptable to Engineering for use.
175	A120093 12-18-64	Visual inspection of the LOX instrument probe flange, P/N 1A59203-503, (LL fitting) revealed a ding .021 X 3/16 in. X 1/8 in. in area.	The defect was reformed to B/P requirements. Flange to tube weld and tube to segment welds and damaged area were dye checked. Rework was acceptable to Engineering for use.
176	A122169 12-12-64	Visual inspection noted LH_2 fill line elbow (FF), located on dome segment 2, was out of ovality. Should be maximum 0.010, varied to 0.015.	Acceptable to Engineering for use without rework.
177	A123101 12-23-64	X-ray 64-B192 of brackets, P/N 1A39149-1, to dome segment 3, revealed voids in brackets 1 and 2.	Acceptable to Engineering for use without rework.
178	A123102 12-28-64	X-ray 64-B192 of FF elbow to flange weld, located on dome segment 2, revealed voids and scattered porosity in views 2 and 4.	Acceptable to Engineering for use without rework.
179	A123154 1-4-65	a. Five level sensor studs, located between S4 and S5, S5 and S6, and S8 and S9, adjacent to flange weld, were sheared off at less than minimum torque of 40 in. lbs. per B/P. b. One level sensor stud, located adjacent to S7, was found to have defective threads.	a. Defect areas were spotfaced, and new studs were welded to B/P requirements. b. Defective stud was removed, area spotfaced, and a new stud welded to B/P requirements. Rework was acceptable to Engineering for use.

TABLE II, Section 6 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
180	A123158 1-6-65	Visual inspection of the 3/16 in. fillet weld on the JJ fitting, which was located on dome segment 7, revealed a defect 1 1/2 in. long X 0.022 deep X 3/32 in. wide.	The defect area was blended out, dye checked and re-submitted. The rework was acceptable.
181	A123159 1-6-65	An out of contour condition existed in an area 8 in. in diameter, forward of the BB fitting, on dome segment 3 (Ref .360 low).	Acceptable to Engineering for use.
182	A123160 1-7-65	Contour check of aft dome revealed an out of contour condition existing at 60° to 82° latitude, as recorded on QEC chart 652A page 2.	Acceptable to Engineering for use.
183	A133505 3-23-65	Tensile test specimen, S/N E-4, pulled 28,243 psi., below the allowable minimum of 30,000 psi.	Acceptable to Engineering for use.
184	A176702 12-8-65	At aft dome weld seam 2, bond coupon 639 for support, P/N 1B27099-5, job 321, measured 612 psi average, should have been 640 psi average minimum per DPS 32330.	Acceptable to Engineering for use.

TABLE II (Continued)

Section 7. Forward Skirt Assembly, P/N 1A39264-1

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
185	A154277 7-26-65	Between stringers 100 and 105, station 574, there was short edge distance between BJ5 rivets, installed through skin, and doubler, P/N 1A39264-131. Edge distance was 0.200 in., exceeding minimum allowable of 0.375 in.	Acceptable to Engineering for use.
186	A154278 7-26-65	Between stringers 41 and 42, station 621, ten no. 40 pilot holes through plate, P/N 1B54210-1, doubler, P/N 1B55414-5, tee, P/N 1B55414-3, and skin of panel assembly, P/N 1A39264-429, were mislocated 1/2 in., resulting in short edge distances in skin and doublers.	Existing holes were used, but 3/32 in. rivets were substituted for those called out on the print. Four additional 3/8 in. rivets were installed below the mislocated holes. The rework was acceptable.
187	A154281 7-27-65	At stringer 91, 61 in. from the forward face, one DT6 lockbolt through intercostal, P/N 1A39264-57, had short edge distance of 3/16 in. Minimum edge distance allowable was 7/16 in.	Acceptable to Engineering for use.
188	A154286 7-27-65	The following assemblies, installed between stringers 27 and 28, 63 and 64, and 99 and 100, were not required for this stage per effectivity block of B/P 1B41681: a. 10 1/2 in. aft of the forward interface, doubler P/N 1B41681-15, flange assembly, P/N 1B50619-501, and a 0.248/0.257 diameter hole through doubler and skin. b. 44 in. aft of the forward interface doubler, P/N 1B41681-7, flange assembly, P/N 1B50619-501, and a 0.248/0.257 diameter hole through doubler and skin. c. 80 in. aft of the forward interface, doubler, P/N 1B41681-41, and flange assembly, P/N 1B50619-501, and a 0.248/0.257 hole through doubler and skin.	Weld assembly, P/N 1A39264-0619-501 was replaced with a 2 in. doubler lined up with the 0.248/0.257 and 0.468 diameter holes. The rework was acceptable.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
188 (Cont)	A154286 7-27-65	d. 84 in. aft of the forward interface, doubler, P/N 1B41681-43, and a 0.468 in. diameter hole through doubler and skin.	
189	A154294 7-28-65	Four pilot holes were missed in intercostal, P/N 1A39264-279, at stringer 103, resulting in three no. 21 holes and one no. 30 hole through intercostal frame, P/N 1A49629-501, and fitting, P/N 1A93888-2, being mislocated.	The fitting was removed and replaced. A new angle was installed, and one no. 21 hole was double flush plugged. All other attachments were picked up. The rework was acceptable.
190	A154296 7-29-65	At stringer 88, 30 in. from the forward face, one 5/32 in. rivet hole was elongated to 7/32 in., and one was elongated to 5/16 in., through angle, P/N 1A39264-45.	Elongated holes were drilled out for rivets, P/N MS20470 AD6, and one extra rivet, P/N MS20470 AD3, was installed on either side of these rivets, evenly spaced between existing rivets. The rework was acceptable.
191	A154305 7-16-65	At stringer 73, from stations 650 to 675, twenty-five BJ5 rivets had edge distances in web, P/N 1A39264-53, of 3/32 in. to 9/32 in. Minimum allowable edge distance was 3/8 in. per B/P 1A39264.	The third rivet at station 650 was removed and the hole plugged through web and angle, P/N 1A39264-28. All others acceptable to Engineering for use.
192	A154320 7-19-65	At stringers 43, 44, 45, 47, 48, 49, 50, and 51, 22 in. forward of the aft face, there were rivet set cut marks on panel assembly, P/N 1A39264-509.	The raised metal was sanded down, the cuts dye checked for cracks, and all areas burnished carefully with a fine rubber abrasive wheel. The rework was acceptable.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
193	A154474 7-14-65	a. At stringer 22, 56 in. forward of the aft interface, one extra 5/32 in. diameter hole existed in skin panel, P/N 1A39264-407, and stringer, P/N 1A39264-964. If drilled through doubler, P/N 1B39121-5, hole would have a short edge distance of 1/4 in., should have been 1/2 in. minimum. b. At stringer 54, 41 in. and 52 in. forward of the aft interface, four 5/32 in. diameter holes were drilled in the stay out area in stringer, P/N 1A39264-923.	a. No. 40 pilot hole was plugged through all parts with rivet, P/N MS20426AD3. B/P fastener was installed in mislocated hole. b. Surface was smoothed off, and rivets, P/N MS20470DD5 were installed in mislocated holes.
194	A154598 7-23-65	At stringer 91, 29 in. aft of the forward interface, one no. 21 pilot hole for a DT6 lockbolt was mislocated through support, P/N 1A39264-113, stringer, P/N 1A39264-687, skin, P/N 1A39264-737, and frame segment, P/N 1A39629-503. Also, this hole was 3/16 in. off center from one existing no. 30 pilot hole in stringer and skin only.	Acceptable to Engineering for use.
195	A159252 8-13-65	The following holes had no edge distance through fitting, P/N 1B54215-2: a. At stringers 101 and 102, station 615, three no. 30 pilot holes drilled through skin, and four 5/32 in. diameter holes through stringers, skin, and doubler, P/N 1A39264-721. b. At stringers 107 and 108, station 612, six 5/32 in. diameter holes through stringers and skin. The following holes had no edge distance through fitting, P/N 1B54215-503:	a. Rivets, P/N MS20426AD4, were installed in three no. 30 pilot holes, and rivets, P/N NAS 1097DD5, were installed in four 5/32 in. diameter holes through skin, doubler, and stringers. b. Rivets, P/N NAS 1097DD5, were installed through holes in stringers. c. Rivets, P/N NAS 1097DD5, were installed through holes in stringers.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECT	DISPOSITION
195 (Cont)	A159252 8-13-65	c. At stringers 29 and 30, station 615, six 5/32 in. diameter holes through stringers and skin.	
196	A159270 8-23-65	A 2 in. X 5/8 in. honeycomb section was torn loose from the top right hand corner of panel, P/N 1B44602-63.	The paint was stripped from the area, aluminum skins were contoured, the rework area was filled with corfil, and the area was refinished. The rework was acceptable.
197	A159272 8-24-65	Two shur-lok holes had counter bore brake-out in the inboard face of support panel, P/N 1B44602-37, around the .270/.279 insert holes.	Acceptable to Engineering for use.
198	A159273 8-24-65	One shur-lok hole had counter bore brake-out in the inboard face of support panel, P/N 1B44602-21, around the .270/.279 insert hole.	Acceptable to Engineering for use.
199	A159342 8-18-65	a. At stringers 15 and 16, between R/P 3 and 4, one BJ5 rivet through angle, P/N 1A39264-299, and support, P/N 1A39264-85, had short edge distance of 1/4 in. through the angle and 3/16 in. through the support. b. Between stringers 14 and 15, 38 in. forward of aft interface, there was a ding in the skin, P/N 1A39264-667. A dye check for cracks proved negative.	a. Acceptable to Engineering for use. b. A 3/16 in. diameter hole was drilled in the skin to remove the ding, and a rivet, P/N MS20470AD6, was installed in the hole. The rework was acceptable.
200	A159343 8-18-65	a. At stringer 23, station 613, one open no. 40 pilot hole in support, P/N 1B54215-1, was located 1/8 in. from BJ5 rivet. b. At stringer 17, 4 1/2 in. from aft interface, there was one drill mark, 0.015 in. deep, adjacent to a BJ5 rivet in the stringer flange.	a. Acceptable to Engineering for use. b. The area was smoothed out, and a 0.090 in. 7075T6 aluminum doubler was fabricated and installed on the outboard side. Existing fasteners were picked up.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
201	A159367 9-2-65	a. On the surface of the forward interface, between stringers 14 and 15, angle segment, P/N 1A58609-501, was 0.005 in. from flush with angle segment, P/N 1A58609-1, for a distance of 1 1/8 in. b. On the surface of the forward interface, between stringers 95 and 96, angle segment, P/N 1A58609-501, was 0.004 in. from flush with angle segment, P/N 1A58609-1. c. On the surface of the aft interface, between stringers 41 and 42, angle segment, P/N 1A58608-501, was 0.008 in from flush with angle segment, P/N 1A58608-1.	All were acceptable to Engineering for use.
202	A159379 8-23-65	At stringer 31, 28 in. forward of R/P 1, two 5/32 in. rivet holes were double drilled through stringer and skin during installation of attachment, P/N 1B32915-41.	The attachment was cored and drilled for installation of 1/4 in. shank with expander, P/N BB341, through stringer, skin, and bracket.
203	A159448 2-27-66	During final inspection of the stage, damage to three wires on the underside of wire harness 401W205, P/N 1B50237-1C, was discovered. The insulation and shield were torn, showing copper.	Damaged areas were wrapped with teflon tape per DPS 1.357-15. The rework was acceptable.
204	A159450 3-28-66,	During final inspection of the stage, the following defects were discovered: a. The grommet was torn at pin 5 of plug P11 on wire harness 411W11. b. The grommet was torn at pin 11 of plug P16 on wire harness 411W279. c. At stringer 75 of the forward skirt, the fiberglas standoff for wire harness 411W281 was loose from panel 411A91A63.	a and b. Acceptable to Engineering for use. c. Standoff was found to be flexible, but not loose. d. Grommets were repositioned as required. e. Damaged areas were wrapped per DPS 1.357-15.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
204 (Cont)	A159450 3-28-66	d. At stringer 77 of the forward skirt, grommets were recessed in pins 10 and 18 of wire harness 411W279 on panel 411A91A66. e. Between stringers 21 and 22, on the lower panel of the forward skirt, the insulation was cut, exposing the shield, on wire harness 411W6.	
205	A159593 8-30-65	Between stringers 14 and 15, station 630, angle, P/N 1B55414-001-13, would not pick up five existing 1/8 in. diameter rivet holes through skin and doubler, P/N 1A39264-601. Also, angle would not pick up one 5/32 in. diameter rivet hole through skin at stringer 13.	Rivets, P/N MS20470AD4, were installed in 1/8 in. holes, and rivets, P/N NAS 1097DD5, were installed in three 5/32 in. holes. The angle was attached to skin with five evenly-placed rivets, P/N MS20470 AD5. The rework was acceptable.
206	A159651 8-9-65	Sleeves, P/N BN330-1032, were installed with short edge distances at station 647, stringers 9, 11, 27, 39, 41, 45, 57, 53, 56, 58, 59, 63, 65, 69, 71, 75, 77, 81, 83, 87, 89, 93, 95, 99, 101, 105, 107, 1, 7, 31, 37, 43, 49, 55, 61, 67, 73, 79, 85, 91, and 97.	Acceptable to Engineering for use.
207	A159662 8-10-65	a. At stringers 101 and 102, station 647, installation of plate, P/N 1A88817-1, per salvage on FARR A159754, would have resulted in two double drilled no. 30 pilot holes, one hole with short edge distance, and four open unused holes in stringer 101 flange. b. At stringer 102, station 647, installation of the plate would have resulted in one double drilled no. 30 pilot hole and five unused open holes in flange.	Stringers 101 and 102 were removed and replaced. All unused holes between the new stringers were double flush plugged. A new plate was installed, and the whole assembly refinished. The rework was acceptable.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
208	A159771 8-3-65	a. At stringer 91, station 615, one huckbolt had short edge distance in intercostal, P/N 1A39264-977. b. At stringer 22, 4 in. aft of the forward interface, one huckbolt had short edge distance on angle, P/N 1A39264-287.	a. Acceptable to Engineering for use. b. One rivet, P/N MS20470, was installed 3/8 in. from huckbolt at a 45° angle.
209	A159792 8-4-65	5/32 in. rivets had short edge distance at the following locations: a. Stringer 37, forward end, in angle, P/N 1A92868-1. b. Between stringers 36 and 37, station 623, in angle, P/N 1A39264-693. c. Stringer 47, station 623, in angle, P/N 1A39264-271. d. Stringer 46, station 623, in intercostal, P/N 1A39264-265. e. Stringer 47, station 623, in intercostal, P/N 1A39264-625. f. Stringer 47, station 615, in cap, P/N 1A39264-277, and web, P/N 1A39264-175. g. Station 623 to forward interface, in intercostal, P/N 1A39264-417. h. Stringer 49 in fittings, P/N 1B53149.	Acceptable to Engineering for use.
210	A162988 9-25-65	a. At stringer 19, 27 in. aft of the forward interface, one 1032 blind nut through intercostal cap, P/N 1A39264-007, and fitting, P/N 1A93888-2, was mislocated 1/8 in. aft.	a. The fitting was removed and replaced, and the hole in the cap was double flush plugged. b. The hole was double flushed plugged with rivet, P/N MS20426AD3.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
210 (Cont)	A162988 9-25-65	b. Between stringers 21 and 22, at the forward interface, one extra no. 40 pilot hole was drilled in angle segment, P/N 1A58609-1.	
211	A163075 10-8-65	a. At stringers 21 and 23, station 647, angle, P/N 1A39264-013-3, was mislocated too close to the frame. b. At stringers 22 and 23, station 647, one 5/32 in. hole through each stringer fell on the edge of fitting, P/N 1B34960-1. c. At stringer 23, station 647, one 5/32 in. hole through stringer and skin fell in the radius of fitting, P/N 1B34960-1. d. At stringer 22, station 647, three 5/32 in. holes through stringer and skin interfered with the installation of fitting, P/N 1B34960-1, and angles, P/N's 1A39264-705 and -013-3. e. At stringer 22, station 644, one 5/32 in. hole through angle, P/N 1A39264-013-3, skin, and stringer fill in the radius of fitting, P/N 1B34960-1.	a. Acceptable to Engineering for use. b. The forward edge of the fitting and the angle flange was trimmed to clear rivet. c. The fitting was spotfaced, and a HL20-6 hi-lok was installed. d. The angle was trimmed and the holes were plugged. e. The fitting was spotfaced and a HL-20 hi-lok installed. All rework was acceptable.
212	A163339 9-4-65	At stringer 14, station 615, twelve 5/32 in. diameter holes and one no. 40 pilot hole through stringer, skin, P/N 1A39264-9, doubler, P/N 1A39264-60, and intercostal, P/N 1B55414-001-9, were spaced 1 in. apart. Spacing should have been 7/8 in. apart per B/P 1A39264.	One hole at each end of pattern was plugged using rivets, P/N's MS20470AD3 and AD5. The rework was acceptable.
213	A168776 11-10-65	Two temperature sensors were missing from the forward skirt, 41 in. up from the bottom between stringers 100 and 101.	New transducer 426MT605 was installet, relocated 1 5/16 in. horizontally.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
214	A168974 11-6-65	There was a 1/2 in. cut in the insulation of wire 3SJ on wire harness 411W303, below clamp 107, exposing the shield.	The damage was repaired per DPS 1.357-15, paragraph G.4.b 1, 2, 3, 4.
215	A169059 10-15-65	Wire harness 411W283, P/N 1B50895-1, S/N 00001, had the feedthrough between stringers 15 and 16 installed backwards.	The feedthrough was removed and reinstalled per B/P. The rework was acceptable for use.
216	A169063 10-16-65	Nozzle, P/N 1A87617-1, could not be installed because two studs, P/N 1B29309-1, fell in the radius of the angle, P/N 1A39264-016-9.	The angle was shimmed to pick up the rivets and the studs. The rework was acceptable to Engineering.
217	A169177 10-25-65	The insulation of wire harness, P/N 1B44918-1, was cut below the position 1 break-out, where the wire harness narrowed to two wires, at the right of the clamp.	The cut did not expose the conductor. Acceptable as is.
218	A176841 1-7-66	Gusset, P/N 1A87755-11, was set at 82°, should have been at 90° per B/P; also, a required 1/8 in. dimension was held at the gusset base, but was 1/4 in. at the gusset toe. Installation of brackets per B/P 1B37688 was affected.	A 7075-T6 filler was installed as required between the gusset and bracket, P/N 1B37688-9, to compensate for the out of tolerance conditions.
219	A184727 2-28-66	During final inspection of the stage, bonding strap, P/N 1B28424-505, at stringer 70, station 676 of the forward skirt, was found to have a 1/4 in. break at the edge of the isolator.	The bonding strap was trimmed per Engineering instructions to remove the damaged area. The rework was acceptable.
220	A188674 2-25-66	In wire harness 411N279 on forward skirt panel 8, six "DS" type deutsch connectors had the following defects: a. The shield showed at the back of pin 10 of plug P8. b. The shield showed on pins 10 and 11 of plug P12.	Acceptable to Engineering for use.

TABLE II, Section 7 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
220 (Cont)	A188674 2-25-66	c. The shield showed on pin 11 of plug P15. d. The shield showed on pin 10 of plug P18. e. A rubber grommet was missing at the back of pin 11 of plug P19. f. The face of the large grommet was damaged between pins 10 and 11 of plug P14.	
221	A188675 2-26-66	Two wires in wire harness 427W204, P/N 1B44923-10, each had torn insulation in two places, showing copper.	The damaged areas were wrapped with teflon tape. The rework was acceptable.

TABLE II (Continued)

Section 8. Aft Skirt Assembly, P/N 1A39295-1

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
222	A139692 6-27-65	Between stringers 33 and 34, station 220, on cap angle, P/N 1A87929-67, 3/8 in. X 45° scarf should have been 1/4 in. X 45° per B/P 1A87929. This caused a short edge distance for a 3/16 in. hi-lok.	Acceptable to Engineering for use.
223	A147104 6-28-65	Between stringers 23 and 24, station 204, four no. 40 pilot holes, double drilled in frame, P/N 1A83217-903, would not align with pilot holes in the skin and splice.	The holes were double flush plugged with rivets, P/N MS20470-5. Six attachments above the four holes were replaced with rivets, P/N MS20470-6. The rework was acceptable.
224	A147105 6-28-65	At stringers 4, 37, 54, 61, 111, 130, and 134, station 286, one pilot hole drilled through the skin at each location fell on the edge of frames, P/N's 1A93255-509, -1, -501, and -503.	All holes were double flush plugged. The pilot holes were plugged with rivet material, and rivets, P/N NAS 1097OD, were installed in drilled out holes. The rework was acceptable.
225	A147122 7-1-65	a. At stringer 58, station 286, one hole was double drilled through frame, P/N 1A93255-503, with a 1/32 in. web between holes. b. At stringer 58, station 286, four 5/32 in. holes and one no. 40 pilot hole were drilled through frame, P/N 1A93255-503, where there should have been only three 5/32 in. holes. This condition also occurred at stringer 57.	a. No. 40 pilot hole was plugged with rivet, P/N MS20426AD3 and the 5/32 in. hole was plugged with rivet, P/N MS20426AD5. b. Five rivets, P/N MS20426AD5, were installed at both locations, instead of three as called out on B/P. All rework was acceptable.
226	A147125 7-2-65	At stringers 24, 26, 28, 31, and 33, 13 in. to 28 in. from the forward interface, twenty CY6 rivets installed in each stringer should have been BJ5 rivets per B/P 1A87847.	Acceptable to Engineering for use.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
227	A147341 6-18-65	Between stringers 108 and 109, station 256, doubler, P/N 1A94404-19, was mislocated 5 1/2 in. aft, resulting in seven extra 5/32 in. holes and nine extra no. 40 pilot holes being drilled in skin, P/N 1A39295-215, only.	The doubler was relocated and installed per B/P 1A94404, and an identical doubler was fabricated and installed below it. The rework was acceptable.
228	A147346 6-19-65	The following holes were mislocated between stringers 91 and 92, station 240: a. Three no. 40 pilot holes, resulting in one hole through skin, P/N 1A39295-215, and angle, P/N 1A87649-63, falling on the center line of the splice between caps, P/N's 1A87649-45 and -67., b. Two no. 21 pilot holes through skin and caps, and one no. 40 pilot hole through skin and angle, with the result that one no. 21 pilot hole fell on the center line of the splice, partially picking up both caps.	DT6 fasteners were installed in all holes, secured with collars on the skin side. The rework was acceptable.
229	A147354 6-20-65	At stringer 26A, station 256, two no. 21 pilot holes through ring, P/N 1A94404-3, doubler, P/N 1A94404-27, and skin, P/N 1A95485-503, located on the center line of stringer, P/N 1A89121-1, and penetrated the stringer about 1/16 in.	The hole was plugged through the ring and the doubler. The hole through the skin was acceptable as is. The rework was satisfactory.
230	A147357 6-21-65	No. 40 pilot holes for BJ5 rivets were misaligned or mislocated at the following locations: a. Stringer 124, 4 7/8 in. below station 220. b. Stringer 126, 4 7/8 in. below station 200.	a. Holes were double flush plug riveted, and holes in web, P/N 1A39295-138, used for attachments. b. Fasteners, P/N MS20470-6, were installed.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
230 (Cont)	A147357 6-21-65	c. Stringer 126, station 220. d. Stringer 128, station 220. e. Between stringers 128 and 130, 11 1/8 in. above station 200. f. Stringer 130, 5 in. below station 220. g. Stringer 128, 1 1/2 in. below station 240.	c and d. Holes were relocated and mislocated holes left open. e. Holes were double flush plug riveted. f and g. Fasteners, P/N MS20470-5, were replaced with fasteners, P/N MS20470-6.
231	A147454 6-23-65	Two 1/8 in. diameter holes drilled through the skin, P/N 1A39295-191, fell at the edge of frame segment, P/N 1A93255-505. One hole was between stringers 96 and 97, the other was between stringers 103 and 104.	The frame segment was cut out two places to provide minimum clearance for installation of B/P fasteners. The rework area was alodined and accepted for use.
232	A147456 6-23-65	Between stringers 66 and 72, station 256, ring, P/N 1A94404-5, taperd 3° from flange to crown, resulting in 1/8 in. gaps between fitting, P/N 1B50757-1, and the inside surface of skin, P/N 1B44256-1.	A tapered shim was installed between the fitting and the ring. The rework was acceptable.
233	A147457 6-23-65	Between stringers 3 and 4 and 140 and 141, station 220, the outside surface of skin, P/N 1B44256-1, had drill marks 0.020 in. to 0.025 in. deep.	Doublers were installed between stringers. The rework was acceptable.
234	A147458 6-23-65,	Rivets installed in stringers 141 to 3 rode on the edge of cap, P/N 1A87929-27, and rivets installed in stringers 69 to 75 rode on the edge of cap, P/N 1A87929-31.	The interfering rivets were removed and replaced with rivets, P/N NAS 1097 AD, installed flush on the inboard surface of the skin.
235	A147465 6-24-65	a. At stringers 4, 10, 17, 37, 43, 48, 54, 61, 68, 76, 83, 90, 97, 104, 111, 118, 134, and 140, station 200, one pilot hole at each stringer through ring segment broke into the skin splice areas.	a. 1/4 in. was trimmed from the corner of the skin overlap at each stringer, permitting installation of rivets, P/N MS20470-5.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
235 (Cont)	A147465 6-24-65	b. At stringer 4, station 200, one pilot hole broke into the edge of ring segment, P/N 1A83217-1.	b. The no. 40 pilot hole was double flush plugged, and the fastener relocated to maintain minimum edge distance. All rework was acceptable.
236	A147471 6-25-65	Between stringers 127 and 128, station 240, doubler, P/N 1A87649-33, would have had a short edge distance of 1/4 in. when the 3/16 in. holes in cap angles, P/N's 1A87649-17 and -21, were drilled through. Also the doubler was not tapered to 0.030 in. typical per B/P 1A87649.	The doubler was relocated to pick up the first two no. 40 pilot holes in the nineteen hole pattern. The configuration of the doubler without the taper was acceptable as is.
237	A147475 6-26-65	a. Between stringers 90 and 91, station 220, two unauthorized 5/32 in. holes were drilled through angles, P/N 1A87929-77, and skin panel, P/N 1B39295-419-1E. b. Between stringers 75 and 76, station 200, there was a mislocated no. 40 pilot hole through panel, P/N 1A39295-439F, and fitting, P/N 1A83217-1, only. c. Between stringers 74 and 75, station 200, there were two double holes drilled through fitting, P/N 1A83217-1, only.	a. Angles were replaced, and holes in skin were double flush plug riveted. b and c. 1/4 in. diameter attachments were installed through double holes.
238	A154115 7-6-65	a. At stringer 124, station 204, two extra pilot holes in angle, P/N 1A39295-121, would not align with existing fasteners. b. At stringer 130, station 220 to 240, one pilot hole in angle, P/N 1A39295-517, would not align with web, P/N 1A39295-131.	a. The two holes were double flush plug riveted. b. Pilot hole was made to align, and a rivet was installed per print. Rework was acceptable to Engineering.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
239	A154117 7-6-65	Between stringers 116 and 117, station 220, twelve 3/16 in. holes through skin, P/N 1A39295-425, and the forward and aft flanges of station 220 frame assembly, were not to the pattern called out on B/P 1B34789.	The twelve holes were double flush plug riveted, and the surface was refinished.
240	A154133 7-23-65	At stringer 34, between stations 200 and 220, intercostal assembly was located and drilled on the wrong side of attach angle, P/N 1A88940-42, resulting in a 1/2 in. mislocation of the intercostal, and interference between the intercostal flange and fitting, P/N 1B54356-1.	Angle was removed and replaced, and the intercostal was removed and reinstalled per print. The rework was acceptable.
241	A154137 7-24-65	Between stringers 7 and 8, station 240, one 5/32 in. rivet hole through skin, filler, P/N 1A39295-002, and doubler, P/N 1B50907-1, was elongated to 9/32 in.	Hole was reamed to .257/.276 in. diameter, and rivet, P/N MS20470AD8, was installed instead of attachment called out on the print.
242	A154138 7-24-65	a. Between stringers 24 and 26, station 200, rivet hole pattern through skin panel, P/N 1A95485-503, and aft interface angle, P/N 1A83217-501, was not to print. b. At stringer 25, station 200, two 5/32 in. diameter holes through skin panel, P/N 1A95485-503, would fall in the radius of intercostal angle, P/N 1B39253-147, if drilled. c. At stringer 25, station 200, aft interface web, two 5/32 in. diameter holes through web, if drilled, would fall in the radius of angle, P/N 1B39253-159.	a. Acceptable to Engineering for use. b. Rivets were installed in skin panel. Additional rivets were installed in the angle to preserve minimum edge distance. c. The angle was relocated to the opposite side of the intercostal. A filler was installed between angle and intercostal. d. Rivet, P/N MS20426AD6, was installed in place of hi-lok.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
242 (Cont)	A154138 7-24-65	d. At stringer 25, station 220, tee, P/N 1B29253-207, interfered with the installation of a 3/16 in. hi-lok in 3/16 in. diameter hole through doubler, P/N 1A87929-55, and cap, P/N 1A87929-21.	
243	A154289 7-28-65	a. At stringer 19, station 240, one DT6 lockbolt had short edge distance of 1/4 in. on angle, P/N 1B39254-11. Minimum allowable edge distance was 3/8 in. b. At stringer 21, station 240, one DT6 lockbolt had had the same short edge distance through the same angle. c. At stringer 21, station 220, five BJ4 rivets had short edge distance through web, P/N 1B39254-3. Edge distances were 3/16 in. to 1/4 in. Minimum allowable was 5/16 in.	a. Acceptable to Engineering for use. b. and c. Angles, P/N's 1B39254-7 and -11, and web, P/N 1B39254-3, were removed and refabricated for maximum edge distance, and reinstalled. The rework was acceptable.
244	A154304 7-15-65	3/4 in. from stringer 117, at station 220.750, one hole for a 3/16 in. hi-lok, P/N MY6, in fitting, P/N 1A93015-1, through skin, P/N 1A39295-201, and frame angle, P/N 1A87929-69, was drilled oversize to 0.196 in. diameter.	The hole was reamed to .2465/.2485 diameter, and a hi-lok, P/N HL20-8, was installed. The rework was acceptable.
245	A154311 7-16-65	At stringer 31, between stations 200 and 220, two no. 40 pilot holes in umbilical panel, P/N 1A72896-501, were mislocated. Angle, P/N 1B39253-21, had insufficient edge distance to pick up these holes.	Holes were double flush plugged and relocated per print. The rework was acceptable.
246	A154431 7-7-65	The vertical alignment punch marks were out of tolerance, per QEC 769, at the following locations: a. Position II: + 0.014 in. restrained.	Acceptable to Engineering for use.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
246 (Cont)	A154431 7-7-65	b. Position III: + 0.008 in. restrained. c. Position IV: + 0.022 in. restrained. d. Position II: + 0.003 in. unrestrained. e. Position IV: + 0.013 in. unrestrained.	
247	A154434 7-8-65	At stringers 102A and 103A, station 212, a 5 in. diameter cutout in skin, P/N 1A39295-307, was mislocated 1/8 in. toward the center line of stringer 103A, causing a mismatch between stringer, P/N 1A39295-335, stringer, P/N 1A39295-339, and skin.	Doubler, P/N 1A39295-337, was located between stringers 102A and 103A. Hole was trimmed to align with doubler, and a BJ5 rivet installed. The rework was acceptable.
248	A154441 7-9-65	At stringer 26, station 220, one no. 40 pilot hole through stringer and skin would not align with no. 40 pilot hole in fitting, P/N 1B54359-1.	The hole in the fitting was double flush plug riveted, using existing B/P attachment. The rework was acceptable.
249	A154468 7-13-65	Between stringers 124 and 126, between stations 200 and 220, web, P/N 1A39295-360, was trimmed 0 in. to 1/8 in. along the inboard edge, to fit the next assembly. The web had three no. 40 pilot holes plugged approximately 1/4 in. from the existing no. 40 pilot holes.	Acceptable to Engineering for use.
250	A154577 7-21-65	At stringer 45, station 240, a double hole was drilled in fitting, P/N 1B37184-1. A 5/32 in. hole missed no. 40 pilot hole in the fitting.	One .185/.188 diameter hole was hand pulled to align with stringer and skin.
251	A154588 7-21-65	At stringer 46, station 220, one no. 40 pilot hole for a 3/16 in. huckbolt, through stringer, P/N 1A87511-1, skin, and intercostal, P/N 1A88940-403, had short edge distance of 3/16 in. Minimum allowable edge distance was 7/16 in.	Hole was drilled to finish size, exercising caution to maintain the existing edge distance on the pilot hole (3/16 in.) The rework was acceptable.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
252	A159251 8-13-65	a. At stringer 81, station 200, two DT6 lockbolts were installed through angle, P/N 1A88940-3, and aft frame. Also, four DT6 lockbolts were installed through aft frame and support, P/N 1B52935-1. They should have been DT5 lockbolts. b. At stringer 82, station 200, two DT6 lockbolts were installed through aft frame and angle, P/N 1A88940-4. Also, four DT6 lockbolts were installed through aft frame and support, P/N 1B52935-2. There should have been DT5 lockbolts each place per B/P 1A88940. c. At stringer 81, station 220, angle, P/N 1A88940-23, and angle, P/N 1A88940-26, were mislocated.	Acceptable to Engineering for use.
253	A159327 8-16-65	At stringer 34, station 220, there was a mismatch of 1/16 in. between the cap angle of frame, P/N 1A87929-403, and plate, P/N 1A72896-501. The result was a gap of 0.062 in. between angle, P/N 1B54357-1, and the cap angle.	A 0.063 in. 7075-T6 clad aluminum shim was fabricated to fill the gap and pick up existing attachments. The rework was acceptable.
254	A159328 8-16-65,	a. At stringer 26A, station 220.750, four BJ5 rivets were installed in flange. These should have been DT6 lockbolts per B/P 1A39295. DT6 lockbolts could not be installed due to "I" beam construction of stringer. b. Between stringers 24 and 26, station 220.750, frame, P/N 1A79479-21, could not be installed per print, due to interference of two BJ5 rivets. Also, one pilot hole on frame could not be used for the same reason.	a. Hiloks, P/N HL20-8, were installed in place of two of the rivets. The other two were acceptable as is. b. New rivets were relocated and installed to clear the frame. All rework was acceptable.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
255	A159334 8-17-65	At stringer 38, stations 218 to 220, hole pattern was drilled in reverse order through the top of web, P/N 1B52891. This would have resulted in short edge distances through fitting, P/N 1B53626-1, and intercostal, P/N 1B50752-3.	The mislocated holes were plugged with AD3 rivets. New holes were drilled per B/P 1A88940. The rework was acceptable.
256	A159366 9-1-65	At stringers 126 and 128, station 286, frames, P/N's 1A79478-004-7 and -9, were mislocated 0.085 in. too high.	The frames were removed, and new ones were fabricated and replaced per Engineering instructions. The rework was acceptable.
257	A159372 9-2-65	The following problems occurred between stringers 58 and 59, 12 in. forward of R/P 2: a. Doubler, P/N 1B55906-25, could not be installed per print, because the 1/2 in. diameter hole was mislocated 1/4 in. too far outboard from intercostal, P/N 1B39254-401A. b. Existing rivet pattern could not be picked up when installing the doubler, because two of the BJ5 rivets would have had no edge distance, and one would have had short edge distance, at intercostal.	The doubler was relocated, and the 1/2 in. diameter hole elongated to align with 1/2 in. hole in the skin. Otherwise, the installation continued per print. The rework was acceptable.
258	A159375 9-3-65	At stringers 41, station 228, one no. 40 pilot hole through stringer and pan, P/N 1B54247-1, broke into the joggle of the pan.	The hole was double flush plugged with an AD3 rivet. The rework was acceptable.
259	A159378 8-23-65	a. At stringers 101, 102, 103, and 104, station 220, two RL5 rivets, installed through cap, skin, and stringers, should have been BJ5 rivets per B/P 1A39295.	All were acceptable to Engineering for use.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
259 (Cont)	A159378 8-23-65	b. Between stringers 103A and 104, station 200, one BJ4, two BJ6, and one BJ5 rivet were installed through skin, P/N 1A39295-307, and cap angle. Two BJ6 rivets only should have been installed. c. Between stringers 101 and 102, station 200, three BJ6 and one BB6 rivet were installed through skin and cap angle. Only two BJ6 rivets should have been installed	
260	A159391 8-25-65	Between stringers 135 and 136, stations 223 to 275, seventeen dimples were cracked in skin of panel, P/N 1A39295-431.	The area was smoothed out, and a 0.032 in. 7075-T6 aluminum doubler was fabricated and installed. The rework was acceptable.
261	A159393 8-25-65	At stringer 28, station 220, one no. 10 pilot hole for a BJ6 rivet, through angle, P/N 1B39253-69, plate, P/N 1A72896-501, skin, P/N 1A95485-503, and stringer, was elongated from 0.275 in. diameter to 0.325 in. diameter.	The hole was reamed to a .374/.375 in. diameter and bushed. A bolt, P/N NAS 1104-10, washer, P/N AN960-416, and nut, P/N NAS 679A, were installed. The rework was acceptable.
262	A159583 8-27-65	The following defects occurred at stringer 40, station 240: a. Angle, P/N 1B39254-87, was mislocated 1/4 in. toward stringer 41, resulting in a 1/4 in. gap between angle and intercostal, P/N 1B39254-421. b. One extra bead formed in web, P/N 1A87649-53, interfering with the installation of angle, P/N 1B39254-87.	a. A 0.250 in. filler was fabricated from 7075 T6 aluminum to fill the gap. The area was alodined, and the rework accepted. b. Acceptable to Engineering for use.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
263	A159588 8-27-65	At stringers 71, 72, and 73, station 266, four 5/32 in. diameter holes were mislocated.	Holes were plugged with rivets, P/N NAS 1398 D5. The rework was acceptable.
264	A159589 8-28-65	At stringer 26, station 236, one 3/16 in. diameter hole was mislocated in flange, 3/8 in. aft of stiffener, P/N 1A87847-29.	Rivet, P/N MS20470 AD6, was installed in mislocated hole per print. This was acceptable to Engineering.
265	A159656 8-9-65	a. Between stringers 24 and 25, station 225, two 3/16 in. diameter holes through skin and angle, P/N 1A87847-33, were mislocated, and fell in the radius and edge of angle, P/N 1B54462-11. b. Between stringers 24 and 25, stations 225 to 220, there was a 0.050 in., gap between angle, P/N 1B54462-11, and skin.	a. Holes were single flush plugged. The angle was installed per print. b. A 0.050 in. shim was fabricated to fill the gap. All rework was acceptable.
266	A159669 8-12-65	The following extra 5/32 in. holes were drilled at stringer 23: a. Station 220 to 240, twenty-seven through skin, P/N 1A39295-213, only. b. Station 240, four through web, P/N 1A87929-65, only. c. Station 240, four through web, P/N 1A97649-39, only.	All extra holes were plugged with rivets, P/N MS20470 AD5. The rework was acceptable.
267	A159674 8-12-65	At stringer 51, station 200, one no. 40 pilot hole in bracket, P/N 1B52982-1, was drilled intersecting a 5/32 in. hi-lok hole through station ring segment, resulting in elongation of the 5/32 in. hole to 0.250 in.	The no. 40 hole was double flush plugged. Drilled bracket was replaced, and the rework was acceptable.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
268	A159761 8-2-65	At stringer 52, between stations 200 and 240, seven BJ5 rivets attaching intercostal, P/N 1B39254-409, to panel skin, P/N 1A39295-413, and stringer, P/N 1A39295-906, had short edge distance.	Acceptable to Engineering for use.
269	A159765 8-2-65	a. At stringer 43, station 240, both one 5/32 in. rivet hole through skin, P/N 1A39295-251, and skin, P/N 1B44764-1, and one 5/32 in. rivet hole through stringer and skin, fell in the edge of channel, P/N 1A39295-635. b. At stringer 42, station 250, two 5/32 in. rivet holes through skin and stringer had short edge distance on channel, P/N 1A39295-635. c. At stringer 43, station 256, four 5/32 in. rivet holes through skin, and two through stringer and skin, fell on the edge of channel, P/N 1A39295-635.	Holes were plugged with rivets, P/N NAS 1097DDS, without picking up channel. The rework was acceptable.
270	A159797 8-5-65	a. At stringer 104, stations 208 and 215, four 5/32 in. rivet holes at each station fell in the radius and edge of doubler, P/N 1A39295-337. b. At stringers 102A and 103A, stations 208 to 215, 5/32 in. rivets, P/N MS470, through skin, P/N 1A39295-307, and doubler, P/N 1A39295-337, fell in the crown area of the stringers.	a. The doubler was removed and the holes were plugged. Then the doubler was replaced and the holes relocated. The rework was acceptable. b. Holes were opened to 3/16 in., and 3/16 in. blind rivets were used.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
271	A162978 9-22-65	a. At stringer 124, station 220, it was impossible to install one RK5 rivet through angle, P/N 1A39295-107, and web, P/N 1A39295-133, one through angle, P/N 1A39295-369, and web, and one RK6 rivet through angle, P/N 1A39295-107, angle, P/N 1A39295-309, and web. b. At stringer 130, station 205, it was impossible to install one RK6 rivet through web, P/N 1A39295-661, angle, P/N 1A39295-609, and angle, P/N 1A39295-125. c. At station 220, it was impossible to install one RK6 rivet through angle, P/N 1A39295-369, angle, P/N 1A39295-609, and web, P/N 1A39295-661.	Jo-bolts, P/N P260, were installed instead of rivets. The rework was acceptable.
272	A162979 9-22-65	Between stringers 38 and 39, station 220, tee, P/N 1B55017-3, picked up existing attachments in frame, P/N 1A87929, resulting in short edge distances of 7/32 in. to 1/4 in. for BJ5 rivets. Minimum allowable edge distance was 3/8 in.	Acceptable to Engineering for use.
273	A162984 9-24-65	a. At stringer 124, station 220, there was a gap of .003/.006 in. between web, P/N 1A39295-131, and clip, P/N 1A39295-367. b. At stringer 124, station 240, there was a gap of 0.007 in. between web and clip. c. At stringer 130 station 220, there was a gap of 0.005 in. between web, P/N 1A39295-659, and clip, P/N 1A39295-367.	Areas were shimmed to eliminate gaps with AMS4013 lam shim stock. The rework was acceptable.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
274	A163055 10-1-65	RL5 rivets could not be installed through the cap of frame, P/N 1A87929-405, and skin, P/N 1B44256-1, because the areas were inaccessible, at the following locations: a. Stringers 71, 73, and 74, station 220. b. Stringers 70, 71, 73, and 74, station 240. c. Stringers 142 and 143, station 220.	Jo-bolts, P/N P200, were installed in place of rivets per DPS 3.67-11. The rework was acceptable.
275	A163080 10-9-65	At stringers 126 and 128, station 220, supports, P/N's 1B53358-3 and -9, could not be installed using B/P fasteners, because fasteners were in a blind area.	Jo-bolts, P/N P200, were used to install the supports.
276	A163203 9-7-65	a. Between stringers 142 and 143, one 1/2 in. tab was missing from cap angle, P/N 1A83216-47. b. 25/64 in. diameter hole could not be drilled in the cap angle because edge distance would have been 1/4 in.	The conditions were reworked per SEO 1A83216-005A. The rework was acceptable.
277	A163233 9-14-65	a. Between stringers 73 and 74, 71 and 70, and 142 and 143, stations 260 and 226, eight 1/4 in. holes at each station, drilled through skin and fittings, P/N's 1B50757-1 and -2, fell in the radius edge of the fittings. b. At stringer 142, station 220, there was a gap of 0.020 in. between intercostal angle, P/N 1B39246-11, and APS fitting, P/N 1B52785-1. c. At stringers 1 and 2, station 220, there was a gap of 0.018 in. between angles, P/N's 1B39246-11 and -12, and APS fittings, P/N's 1B52785-1 and -2.	a. The fittings were spotfaced to receive B/P attachments. b, c, and d. Shims were fabricated and installed to fill gaps per Engineering instructions. All rework was acceptable.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
277 (Cont)	A163233 9-14-65	d. At stringers 72 and 73, station 220, there was a 0.018 in. gap between angles, P/N's 1B39246-11 and -12, and APS fittings, P/N 1B52185-1.	
278	A163278 9-13-65	At stringer 130, station 240, one 3/16 in. huckbolt through angle, P/N 1A39295-617, skin, and stringer, had a short edge distance of 1/4 in. on the angle only. Minimum allowable edge distance was 3/8 in. per B/P 1A39295.	Acceptable to Engineering for use.
279	A163280 9-14-65	a. Between stringers 113 and 114, station 220.750, intercostal P/N 1B39254-413B, had width of 4 11/16 in. Width should have been 4 13/16 in. ± 1/32 in.	Washers, P/N 50111D13H0645, were used as required to clear brackets, P/N 1B34789-19B. The conditions were acceptable otherwise.
		b. At stringers 116 and 117, station 220.750, two intercostals, P/N 1B34789-13B, were 4 23/32 in. wide. B/P width was 4 27/32 in. ± 1/32 in. At stringers 44 and 45, station 220.750, the same condition existed.	
280	A163282 9-15-65	a. At stringer 115, station 205, one hole, for a 10/32 in. bolt, through intercostal, P/N 1A88940-431, bathtub fitting, P/N 1B27042-515, and bracket, P/N 1B53398-1, had short edge distance of 0.25000 in. Minimum allowable edge distance was 0.37500 in.	Both conditions were acceptable to Engineering for use.
		b. At stringer 33, station 220, one BJ5 rivet through web, P/N 1B39253-197, and angle, P/N 1B39253-193, fell in the transition of the joggle, causing a shanked rivet.	

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
281	A163283 9-16-65	At stringers 120 to 121, station 286, there was a 0.020 in. mismatch between the forward interface and door assembly, P/N 1A68145-1.	A 0.016 in. shim was fabricated, and installed on the forward surface of door assembly. Existing attachments were picked up. The rework was acceptable.
282	A163287 9-20-65	The following mislocated holes were drilled at stringer 101, station 220: a. Two mislocated 1 1/2 in. in panel, P/N 1B39221-63A. b. Two mislocated 1 1/2 in. in panel, P/N 1B39221-65A. c. Four mislocated 1 1/2 in. in intercostal, P/N 1B39254-407. d. Standoff, P/N 1B56509-1, was damaged by a mislocated hole.	a and b. Holes were plugged and relocated. c. Holes were plugged and the reworked areas were alodined. Holes were relocated per print. d. Standoff was removed and replaced per print. All rework was acceptable.
283	A163292 9-28-65	a. One BJ5 rivet interfered with the installation of block, P/N 1B28215-1, at stringer 54, station 218. b. At this location, one expander, P/N BB341-8, could not be installed because the area was inaccessible.	a. Rivet, P/N MS20426 AD4, was installed in place of the BJ5. b. The blind nut attachment was replaced with nut, P/N NAS67908, and washer, P/N AN960. All rework was acceptable.
284	A163349 9-9-65	a. At stringer 102, station 219.5, one DT6 hole had edge distance of 1/4 in. on intercostal, P/N 1A88940-429C. Minimum allowable edge distance was 3/8 in. b. At stringer 28, station 206, one BJ6 rivet had edge distance of 1/4 in. Minimum allowable was 7/16 in.	Acceptable to Engineering for use.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
285	A168766 2-1-66	At aft skirt station 210, between stringers 38 and 40, yaw accelerometer support, P/N 1B54523-1, was mislocated. One dimension was 9.126 in., should have been 9.064 ± 0.010 in., one dimension was noted as parallel to "B" within 0.125 in., should have been within 0.060 in.	The support was relocated per Engineering instructions. After two reworks, the installation was acceptable for use.
286	A168949 10-26-65	Bracket, P/N 1B57036-3, could not be attached per B/P 1B57036, as the area had been closed by previous installations.	Correct grip length Jo-bolts, P/N P200, were installed per DPS 3.67-11. Rework was acceptable for use.
287	A169065 10-18-65	On run 404W2 of wire harness, P/N 1B57892-INC, the insulation was cut, exposing the conductor, 1/4 in. from potted connector J1 at the umbilical panel.	Wire harness was removed and replaced. The rework was acceptable.
288	A169067 10-18-65	Wire harness run 404W220, P/N 1B50214-1B, had the insulation cut, exposing wires, 2 in. below the breakout to panel 3.	The damaged areas were wrapped with teflon tape per DPS 1.357-15, and the wire was megger checked.
289	A169068 10-19-65	There was a cut in the insulation on wire harness run 404W2, P/N 1B57892-1, 1/4 in. from the potted connector.	The condition was accepted after more potting compound was added.
290	A169074 10-25-65	Eight 0.290 in. diameter holes were drilled through in rack assembly, P/N 1B28826-601, exceeding the 0.375 in. B/P depth requirement.	Acceptable for use.
291	A169145 11-4-65	Holes with nut plates for main tunnel support panel installation were mislocated 1/8 to 3/16 in. at six places.	Existing flanges were removed at three places. False flanges were installed and attached to the webs of the angles and channels. The flanges were trimmed on installation to avoid interference.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
292	A169176 10-25-65	Isolator, P/N 1B32267-1, rode the radius of gusset, P/N 1B53399-1, at stringer 115, station 218.	A 7075-T6 shim, 3/4 X 1 3/16 X 0.020 in., was installed between gusset and the isolator.
293	A169183 10-29-65	Three conductors in wire harness, P/N 1B56366-1, were cut through the outer insulation.	The damaged wires were removed and replaced.
294	A174151 11-17-65	There were numerous cuts in the insulation of wire harness 427W204, P/N 1B44923-1, exposing the shield.	The insulation was repaired per DPS 1.357-15, paragraph G.4.b, 1, 3, and 4. The rework was acceptable.
295	A176609 12-9-65	Bracket, P/N 1A44576-31, union, P/N AN832-4D, and nut, P/N MS2440004, were not installed on the aft skirt assembly prior to installation of the skirt on the vehicle. Following installation, the area was inaccessible.	Area was reworked per instructions on salvage SEO 1B87649-006. The rework was acceptable.
296	A176830 12-27-65	a. On panel, P/N 1B53358-1, between stringers 126 to 128, plug, P/N SLP523-3-16-538, and spacer, P/N SLS523-3-16-538, were installed backwards per B/P 1B53358D.	Acceptable to Engineering for use.
297	A176846 1-9-66	Wire harness 404A69W200 had two holes in the holes in the outer jackets of shielded wires; one opposite connector P19 of run 404W209, and one at the bend of the breakout to connector P29.	Acceptable to Engineering for use.
298	A176831 12-28-65	At aft skirt station 210, stringer 35, four nutplates were mislocated on angle, P/N 1B39250-901.	The two forward holes were opened 1/16 in. aft, and the two aft holes were opened 1/16 in. forward. The rework was acceptable to Engineering for use.

TABLE II, Section 8 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
299	A184315 1-21-66	In the aft skirt area, pipe assembly, P/N 1A96658-1, had two 3/64 in. deep dings about 5 feet from the umbilical disconnect, causing the pipe to flatten out.	Acceptable to Engineering for use.
300	A188663 2-23-66	During megger test of wire harness 404W209, 500 volts were applied across pins E and C at J-1 of temperature bridge, P/N 1A82274-517, S/N 01072R. Connectors should be disconnected during megger check.	Unit tested per Douglas specification 1A98238 "J", paragraphs 3.2.1.2.4 and 3.2.1.2.6. Unit failed test and was scraped.
301	A188672 2-25-66	The teflon insulation was torn at the following locations in wire harness 404A69W200, P/N 1B44934-1F: a. 5 in. from the base of connector P29. b. 3 1/2 in. to the right of connector P9 break out. The tears exposed the shielding, however, the shielding was not damaged.	Damaged areas were wrapped with teflon tape per DPS 1.357-15.

TABLE II (Continued)

Section 9. Thrust Structure Assembly, P/N 1A39316-1

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
302	A139613 5-25-65	Two hi-loks, P/N HL-19-6, and four lockbolts, P/N NAS 1466, through splices, P/N's 1A67839-5 and -7, had short edge distance of 5/16 in. to 3/8 in. on frame, P/N 1A67839-3. Edge distance should have been 1/2 in. minimum per B/P 1A67839.	Acceptable to Engineering for use.
303	A147116 6-29-65	In channel, P/N 1A39316-9, a .1865/.1885 diameter hole for 3/16 in. hi-lok was elongated to 0.250 in. The same hole through skin, P/N 1A68666-1 had diameter per print, but had short edge distance of only 5/32 in.	The hole was reamed to .2485/.2465. A hi-lok, P/N HL18-8 was installed in place of hi-lok called out in the print. The rework was accepted.
304	A147460 6-23-65	a. 3 in. from the aft end of stringer 21A, one extra no. 30 pilot hole was drilled in skin, P/N 1A68951-1, 7/32 in. from an existing 5/32 in. diameter hole. b. 4 in. from the aft end of stringer 21, two extra no. 30 pilot holes were drilled through skin, P/N 1A68951-1, equally spaced between two 5/32 in. holes.	The extra holes were single flush plugged with rivets, P/N MS20426AD4, and the area refinished. The rework was acceptable.
305	A147467 6-24-65	At aft end of stringer 22 1/4, one no. 40 pilot hole through the stringer had short edge distance as a result of the installation of cap, P/N 1B57050-7, per B/P.	New, longer stringers were fabricated and installed, omitting the joggle at the forward end. Spacers were made to permit installation of parts. The areas were primed and the rework was accepted.
306	A147468 6-24-65	a. At stringer 11, station 65, three DT12 holes had edge distance of 0.380 in. Minimum allowable was 0.625 in. b. At stringer 8, station 65, edge distance on the three DT12 holes was 0.400 in. Minimum allowable was 0.625 in.	Acceptable to Engineering for use.

TABLE II, Section 9 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
306 (Cont)	A147468 6-24-65	c. At stringer 20, station 65, edge distance on three DT12 hole was 0.450 in. Minimum allowable was 0.625 in. d. At stringer 23, station 65, edge distance on three DT12 holes was 0.475 in. Minimum allowable was 0.625 in.	
307	A154140 7-26-65	Between stringers 1 3/4 and 2, support, P/N 1B34894-23, was mislocated 13/32 in. forward, with the following results: a. Four extra 5/32 in. holes were drilled through skin, P/N 1A68349-1. b. Angle, P/N 1B34894-33, was mislocated, with the result that two extra 5/32 in. holes were drilled through stringer, P/N 1A39316-25.	The support was re-located to pick up stringer attachments. The extra holes were double flush plugged. A new angle was trimmed to pick up all B/P attachments. The rework was acceptable.
308	A154295 7-28-65	20 in. from the aft end of stringer 23, one .185/.188 in. diameter hole through stringer, P/N 1A39316-43, skin, P/N 1A68951-1, and stringer, P/N 1A78013-1, was countersunk on stringer, P/N 1A39316-43. It should have been countersunk on stringer, P/N 1A78013-1, per B/P 1A39316.	A conical washer was fabricated and installed with the B/P fastener. The rework was acceptable.
309	A154316 7-17-65	At stringer 18A, two no. 21 pilot holes through pan, P/N 1B39870-4, had short edge distances. If stiffener, P/N 1B39870-12, were installed, two pilot holes would have fallen on the edge of stiffener, and two would have short edge distance. Eight DT6 lockbolts had short edge distance.	Short edge distance through pan was acceptable to Engineering. A new stiffener was fabricated, omitting pilot holes, and adding 3/8 in. additional edge material. The rework was acceptable.

TABLE II, Section 9 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
310	A154430 7-7-65	At stringer 1, a 5/32 in. hole was drilled at an angle through splice plate, P/N 1B67503-9, running into a 3/16 in. lockbolt.	The plate was removed and replaced, and HL20 hi-loks were installed in place of lockbolts in the last two rows of fasteners. The rework was acceptable.
311	A154473 7-14-65	At stringer 23 1/4, 22 1/4 in. from the forward frame, two 5/32 in. holes were drilled in helium bottle support, P/N 1B39870-3, 3/16 in. off center from 5/32 in. holes through cap, P/N 1B57050-7, frame, P/N 1A67839-3, skin, P/N 1A68549-1, and stringer.	The mislocated holes were double flush plugged, and relocated to match existing holes in the structure. One huckbolt, P/N R3007-6, was installed on each side of the plugged holes. The rework was acceptable.
312	A163085 10-12-65	The skin, P/N 1A68314-501, had a 7/32 in. long crack at the edge of a no. 30 hole.	A 7075-T6 doubler was riveted in place per Engineering instructions. The rework was acceptable.
313	A163088 10-13-65	Between stringers 21 and 21 1/4, 22 in. aft of angle segment, P/N 1A39316-3, incorrect edge distance was noted at nine holes, with a maximum deviation of 1/8 in.	Three holes were drilled to size to obtain maximum edge distance. Six holes with maximum deviation of 3/32 in. were acceptable as located.
314	A168727 10-27-65	Tee, P/N 1B37637-23, would not pick up existing fasteners per B/P 1B37637.	A 1/2 X 1/2 X 0.090 in. 7075-T6 spacer was installed under the attachment head at the forward end of the tee. At the aft end, existing structure holes were double flush plugged with AD5 rivet material, and a 4 X 7/8 X 0.090 in. 7075-T6 doubler was installed inboard of angle, P/N 1A68381-31. All added parts were zinc chromate primed prior to installation.

TABLE II, Section 9 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
315	A168729 10-28-65	The pilot hole patterns in tees, P/N's 1B39324-3 and -33, did not match the respective hole patterns drilled in stringer assemblies, P/N's 1A67502-511 and -505.	Pilot holes that did not pick up existing attachment holes were plugged, as were holes in the stringers that did not have a minimum of 2 diameters edge distance from the ends of the tees. The tees were then located and installed per B/P.
316	A168940 10-22-65	On stringer 19A, two holes for attachment bolts, P/N MS20004-14, did not meet edge distance dimension by 1/4 in. Similar conditions existed on stringers 1A, 5A, and 11A.	Condition acceptable for use all places.
317	A168950 10-27-65	30 in. aft of the mating surface, between stringers 18 3/4 and 19, a crack was visible in the skin, extending forward from the no. 21 drilled rivet hole.	A 0.430 in. X 0.032 in. 7075-T6 aluminum button was fabricated to fill the hole. A 1 5/8 in. X 2 1/4 in. X 0.32 in. doubler was made and installed, picking up the existing hole and button with B/P attachment, and also picking up four other existing attachments. The area was primed with zinc chromate, and the rework accepted.
318	A169072 10-20-65	Screw, P/N 50816-28, on panel, P/N 1B31967-501, rode the tee, P/N 1A39324-25, at station 153, stringer 16. Nut A3 on panel, P/N 1B31967-507, rode the tee, P/N 1A39324-27, at station 158.5. Four nut plates, P/N NAS 1068A3, rode in the radius of the outboard side of tee, P/N 1B39324-27.	The corners of the tees were radiused and the reworked items were accepted by Engineering for use.

TABLE II, Section 9 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
319	A169129 10-30-65	The collar of the huckbolt fastening support, P/N 1B37286, on the inside of thrust structure, P/N 1A39316-1, did not allow clearance for the LOX tank.	The existing huckbolt was replaced by one with collar on the outside of the structure. The rework was acceptable.
320	A169137 11-2-65	When the thrust structure was positioned to the stage with a 0.062 in. gap, 73 holes did not meet the 0.0 to 0.010 in. gap requirement of B/P 1A39312.	Acceptable for use without rework.
321	A169142 11-3-65	One engine thrust structure mounting hole could not be drilled due to an interfering bracket located on the thrust structure.	The required attachment was relocated 5/8 in. clockwise, looking aft, from the existing pilot hole. The open pilot hole was acceptable.
322	A169143 11-3-65	a. Panel, P/N 1B38125-1, was out of parallel with "A" plane by 0.075 in. Maximum deviation tolerable, per QEC 960, was 0.040 in. b. On the K, dimension for panel, P/N 1B38223-1, point 8 read 51.130 in. Should have measured 51.156 in. per QEC 960.	a. 2024-T3 aluminum shims were fabricated and installed in order to bring the panel into parallel with the plane. b. Shims were fabricated and installed to bring the K, dimension into QEC tolerance. All rework was acceptable.
323	A174155 11-18-65	If installed through the thrust structure attachment angle and clip, P/N 1A49613-21, one bolt, P/N 106264-8A, would ride on a hi-lok bolt.	The bolt, P/N 106264-8A, was replaced with bolt, P/N 106264-6A, and nut, P/N NAS 679, per B/P.
324	A174160 11-19-65	There was mashed insulation on four wires of wire harness 403W5, exposing one coax shield.	Damaged areas were wrapped with teflon tape per DPS 1.357-15. The rework was acceptable.

TABLE II, Section 9 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
325	A176828 12-21-65	a. Connector P36, MS3116E-8-4P, 3J type wire 10P34A20WHT, had a cut 3 in. back of the connector on wire harness 404W7. b. On wire harness 403W201, P/N 1B44901-1, connector J3 had a punctured insert adjacent to contact X.	a and b. Connector was removed and replaced, and continuity and megger checks were performed satisfactorily.
326	A184630 1-28-66	At thrust structure stringer 4, station 150, the tip of transducer 403 MT743, P/N 1B50733-1, was offset 1/4 in., causing internal wiring to make contact with the external shell.	The damaged transducer was removed and replaced.
327	A184637 1-31-66	At thrust structure stringer 12, station 170, standoff, P/N 1B37286-501, was broken off, and one rivet, P/N MS20470-AD5, could not be installed per DPS.	The standoff was replaced, using two existing fasteners through the vertical leg of the stringer. The rivet was replaced by a blind rivet, P/N CR 2249-5.
328	A184689 2-2-66	The following defects were discovered concerning panel, P/N 1B38223-501, of rate gyro support, P/N 1B37637-501F: a. Plane of panel was perpendicular at 0.200 in. It should have been at 0.180 in. b. The 51 3/32 in. $\pm$ 1/8 in. dimension, locating the panel, was 51.400 in. at point 5, and 51.450 in. at point 6. c. The 40.250 in. dimension was 40.100 in. to 40.282 in.	2024-T3 shims were fabricated and installed between panel and bracket, to bring all dimensions to within B/P tolerances. The rework was acceptable.

TABLE II (Continued)

Section 10. Auxiliary Propulsion System Modules, P/N 1A83918

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
329	A181337 1-8-66	On APS module two, the right hand side of forward frame, P/N 1B33333-417, of assembly, P/N 1B33333-402, was cracked out 3/4 in. long at the intersection of the tie-in to main beam assembly, P/N 1B43041-1.	A no. 40 stop hole was drilled at the end of the crack. A 0.063 in. doubler was fabricated and installed inside the assembly, using existing attachments. The rework was acceptable.
330	A182126 1-24-66	On APS module two, two no. 30 pilot holes through plate, P/N 1B51328-2, would not align to pilot holes in clip, P/N 1B33333-172.	Rivets were installed with 0.200 in. countersink diameter. The rework was acceptable.
331	A182128 1-29-66	On APS module two, the aft outboard .250/.254 diameter hole through fitting, P/N 1B50886-2, was counterbored too deep. It was counterbored 5/8 in. X 3/32 in. deep, and should have been spotfaced 5/8 in. X 0.062 in. deep.	Acceptable to Engineering for use.
332	A182132 2-2-66	On APS module two, dimples were cracked out on 1/4 in. screw holes at the following locations: a. On the bottom door, P/N 1B51312-1, six places. b. On the top door, P/N 1B51311-1, one place.	The short cracks were radiused out, removing a minimum of material. The remaining cracks were stop drilled, using a no. 50 drill. The rework was acceptable.
333	A184158 2-22-66	On APS module two, one 0.185 in. diameter pilot hole was mislocated 1/8 in. off center in skin, P/N 1B33333-137. The hole should have been drilled out to 1 1/8 in. diameter, however, it was elongated to 1 1/4 in., and would not match the diameter on fitting, P/N 1B58378-1.	The 1 1/8 in. hole was double flush plugged, relocated, and accepted.

TABLE II, Section 10 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
334	A184164 3-10-66	In APS module one, welded tube assembly attachment on quad valve, P/N 1A67912-505, was 1 5/16 in. long but should have been 1 in. long per B/P 1B62574.	Mounting plate assembly, P/N 1B62575, was removed and replaced, and the rework accepted.
335	A184167 3-17-66	In APS module one, two TA brackets were mislocated 1/16 in. and 1/8 in., respectively, and one .202/.207 in. diameter hole was mislocated 1/8 in., per B/P 1A79373.	Conditions were reworked per SEO 1A83918-002, and the rework was acceptable.
336	A184168 3-16-66	On APS module two, the lower flange for the outlet port fitting on module, P/N 1A49998-506, S/N 1046, had no gap at the aft inboard bolt location.	The port was bubble soap checked satisfactorily, and the condition was accepted by Engineering for use.
337	A184170 3-21-66	Three 0.261 in. diameter holes in beam assembly, P/N 1B43041-401E, were mislocated approximately 1/8 in.	A 2024-T3, 3 in. X 6 in. doubler was fabricated and installed, and the holes were relocated. The rework was acceptable.
338	A184172 3-22-66	In APS module one, Veeco leak detector test indicated gross leakage in the quad valve area of APS engine 3.	The area was retested after removing and replacing engine 3 and tube assembly, P/N 1B51492-1, and was then accepted for use.
339	A184173 3-23-66	In APS module one, quad check valve, P/N 1A67912-505, leaked at the outer seal.	The defective check valve was removed and replaced. The module was retested per B/P A659-1A96693-1 PDS2, and accepted by Engineering for use.
340	A198677 4-24-66	On APS module two, the following channels failed to meet the voltage signature requirement of 60 ± 10 volts as specified in paragraph 3.10, engine valve functional test:	After retest using AD3-26 junction box, P/N A659-1B59663-1 PTE2, S/N 1, and console, P/N A659-1B57663-1 PTE3, S/N 1, the channels were found to be within tolerance, and accepted.

TABLE II, Section 10 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
340 (Cont)	A198677 4-24-66	a. Engine A8 - channels 9, 10, 12, 14, and 16. b. Engine A9 - channels 12, 13, 15, and 16. c. Engine A10 - channels 12, 14, and 16.	
341	A198678 4-26-66	On APS module two, temperature transducer, P/N A7-MT630, the resistance measured between pin KK of plug P18 and pins LL and MM of the same plug was 194 ohms. Resistance should have been 217 ± 10 ohms per A659-1B52663-1 PDS1 AT3.	The transducer was removed and replaced. Cable, P/N 1B39226-402A, was reworked to P/N 1B55205-413A, reidentified as such, and installed. The rework was acceptable.
342	A209302 3-25-66	On APS module two, oxidizer propellant control module, P/N 1A49422-507, S/N 0000037, the voltage spike, measured on both solenoids was 160 volts peak. Maximum peak voltage allowable was 50 volts per B/P 1A49422.	The oxidizer control module was removed and replaced. The APS module was then retested without incident.
343	A209309 3-24-66	In APS module one, there was leakage between the injection plate and fiberglas cover of engine A8, in the area of the chamber pressure transducer, P/N MT608.	Acceptable to Engineering for use.
344	A209314 4-7-66	On APS module two, center section web on lofted angle, P/N 1B43041-43, one .202/.207 in. diameter hole was mislocated 1/8 in. vertically from the bottom end of the angle. The mislocated hole caused misalignment of tube assembly, P/N 1B52300-1.	The hole was elongated 1/32 in. to relieve the preload condition of the tube assembly, P/N 1B59953-1. Clips were attached per B/P after hand forming tube assembly, P/N 1B52300-1, for final installation. The rework was acceptable.
345	A209317 4-19-66	On APS module two, there was an internal leak in fuel control module, P/N 1A49422-507, S/N 0000044, at the oxidizer temperature monitor port Y. Leakage of 7 SCCM exceeded the allowable maximum of 0.5 SCCM.	Acceptable to Engineering for use.

TABLE II, Section 10 (Continued)

ITEM NO.	FARR NO.	DESCRIPTION OF DEFECTS	DISPOSITION
346	A209319 4-19-66	On APS module two, fuel control module, P/N 1A49422-507, S/N 0000044, there was a 1/4 in. long crack at port A which allowed leakage at the rate of 4 SCCM. This exceeded the maximum allowable rate of 5 X 10 $^{-5}$ SCC/second.	The fuel control module and the oxidizer fill module were removed and replaced, and the leak check was rerun per test requirements of A659-1A96693-1 PATP3. The results of retest were within tolerance.
347	A209321 4-20-66	On APS module two, the threads were stripped out of one attach hole in fuel propellant control module, P/N 1A49422-507, S/N 000044. The hole, designed for attachment, P/N NAS 1224-C3, was one of those used to attach fitting, P/N 1B59561-1, to the fuel control module.	The damaged thread was reworked by inserting a helicoil, P/N 1191-4CN0250, in the hole. The rework was acceptable.
348	A212034 4-22-66	On APS module two: a. During recovery test of the primary regulator, the "during flow" condition of the oxidizer and fuel ullage pressure was 203 psia, not meeting test requirement of 212 ± 5 psia. b. During recovery test of the secondary regulator, the "during flow" condition of the oxidizer and fuel ullage pressure was 208 psia, not meeting test requirement of 214 ± 5 psia.	Acceptable to Engineering for use.

APPENDIX 4

GLOSSARY

GLOSSARY OF TERMS

ABCL	As Built Configuration List. A listing of the part number, change letter, and manufacturing position index number. Compiled by the Reliability Assurance Department from the manufacturing paper applicable to the stage.
ACS	Automatic Checkout System (Complete Complex).
AFQA	Air Force Quality Assurance
AGC	Automatic Gain Control
AM	Amplitude Modulated Radio Transmission
AO	Assembly Outline. Document controlling the assignment of work to assembly areas, and provides a record of conformance. Planned and released by Manufacturing Planning and verified through Reliability Assurance (Quality Control) procedures.
APS	Auxiliary Propulsion System
CCO	Contract Change Order
CCO	Crystal Controlled Oscillator
COAL	A computer routine for changing data in memory.
Countdown	Tasks carried on during the backward counting (in minutes and seconds) from initiation to conclusion of a propellant loading, or static firing exercise.
Critical Components	Those functional components essential to stage performance.
Dye Check	Dye Penetrant Inspection. Visual identification of surface weld defects, such as porosity and cracks, with a colored dye.
EBW	Exploding Bridge Wire System
ECL	Engineering Configuration List. A tabulated listing of the Douglas/vendor part numbers, Douglas/government/industry standard part numbers, specification and source control drawing numbers, processes and material specification numbers, test requirement drawing numbers, bulk material identification numbers, serialized engineering order and drawing change request engineering order numbers, plus the part number and drawing change letters defining the engineering released design intent applicable to this end item.
ECP	Engineering Change Proposal
End Item	A customer-required system, or any principal system or subsystem elements. Also, those articles covered by major subcontracts, delivered direct to a customer, or provided as customer furnished property to a contractor.
EO	Engineering Order. Engineering document which is used to release design intent, for development and manufacture.
FM	Frequency Modulated Radio Transmission
FARR	Failure and Rejection Report. A report used to identify or divert nonconforming material. Also used to record dispositions of such material, and the corrective action taken to prevent recurrence.

GLOSSARY OF TERMS (Continued)

DDAS	Digital Data Acquisition System
FACI	First Article Configuration Inspection
Form DD250	A material inspection and receiving report used to transfer an end item from one location or responsible agency to another.
Form DD829-1	Historical record used to document scope change verification.
FTC	Florida Test Center. Douglas Missile and Space Systems Division test center at Cape Kennedy, Florida.
Growler Inspection	A sonic inspection method for detecting internal discontinuities in Saturn stage common bulkheads.
GSE	Ground Support Equipment. Equipment whose function is to transport, protect, handle, service, test, check out, and monitor the complete Saturn S-IVB stage, separate assemblies, or components.
H&CO	Handling and checkout drawing (test procedure)
He	Helium
IIS	Inspection Item Sheet
IU	Instrument Unit
KSC	Kennedy Space Center, located in Florida.
LH_2	Liquid Hydrogen
LOX	Liquid Oxygen
Log Book	A compilation of special records, packaged in book form, pertaining to a given end item.
MRB	Material Review Board. A committee which evaluates and determines the disposition of all rejected material (other than obvious scrap or incompletes) and initiates corrective action to prevent recurrence of the nonconformances leading to the rejections.
NPC 200-2	NASA Quality Publication. The Quality Program Provisions for Space Systems Contractors.
OLSTOL	On Line Saturn Test Oriented Language. A method of manual (i.e. typewriter) input to correct a computer program.
PAM	Pulse Amplitude Modulated radio transmission
PCM	Pulse Code Modulated radio transmission
PCL	Planning Configuration List. Tabulated listing prepared by the planning release group containing that information listed on the engineering configuration list plus information required by the planning and manufacturing departments.
Permanent Nonconformance	A condition, signifying material is nonconforming at the time of inspection, and cannot be made to conform exactly.
Permeability	Degree to which one substance will diffuse through or penetrate another.
Porosity	Gas pockets or voids free of solid material occuring in welds.
PDM	Pulse Duration Modulation of radio transmission.

GLOSSARY OF TERMS (Continued)

P/N	Part number
PMR	Programmed Mixture Ratio
ppm	Parts per million
PU	Propellant Utilization system
PUEA	Propellant Utilization Electronic Assembly
psia	Pounds per square inch, absolute. Pressure measurement which includes atmospheric pressure.
psig	Pounds per square inch, gauge. Pressure measurement which does not include atmospheric pressure.
QEC	Quality Engineering Chart. A chart, prepared by Quality Engineering, which provides specific inspection instructions to shop personnel, and a means of recording sequential inspection for each unit fabricated.
RACS	Remote Automatic Calibration System (telemetry checkout).
RF	Radio Frequency
RMR	Reference Mixture Ratio
RPM	Revolutions per minute
RS	Range Safety
RSRS	Range Safety receiver system
SACTO	Sacramento Test Center, California
SC	Scope Change. Changes, requirements, or details of all or any part of a program.
sccm	Rate of flow measurement - standard cubic centimeters per minute.
scim	Rate of flow measurement - standard cubic inches per minute.
SCO	Subcarrier Oscillator
SEO	Serial Engineering Order. Engineering orders, generally used to authorize and describe rework in conjunction with a production change. The SEO is also used to issue information or work authorization when no drawing change is involved, i.e., salvages for manufacturing errors, and authorization for variation from engineering drawing requirements or information.
SIM	Safety Item Monitor
SPCR	Saturn Program Change Request
SSB	Single Sideband, radio transmission
SSC	Space Systems Center. Douglas Missile and Space System Division Center at Huntington Beach, California.
STC	Sacramento Test Center, located at Sacramento, California.
S/N	Serial number
TACD	Test Area Control Document

GLOSSARY OF TERMS (Continued)

TAN	Task Authorization Notice. Douglas work authority.
TCC	Test Control Center.
TCS	Thermo Conditioning System.
TD	Technical Directive
Time/Cycle Significant Item	A component or end item, the measured life of which is important enough to justify running time, cycle, or attribute data collection.
T/M	Telemetry
TR	Test Request
UHF	Ultra High Frequency
Ullage Pressure	The pressure of the gases in the unfilled portion of the propellant tanks.
Ultrasonic Inspection	An inspection method employing ultrasonic waves to detect discontinuities in internal insulation bonding.
Umbilical	Stage/GSE interface point for stage servicing and monitoring from a ground source.
VCL	Vehicle Checkout Laboratory, located at SSC and STC
VCO	Voltage Controlled Oscillator
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio. A measure of antenna efficiency.
WRO	Work Release Order. Document providing authority for the accomplishment of work within the Douglas Missile and Space Systems Division.